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NEW YORK REVIEW OF THE

TELEGRAPH AND TELEPHONE

AN ELECTRICAL JOURNAL.

AMES.

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MRS. MARGARET I. PRESTON, the finest of Southern lady poets, eulogizes Longfellow in the *Literary World* for April 8:

"ULTIMA THULE."

H. W. L.

Wrap the broad canvas close; furl the last sail:
Let go the anchor; for the utmost shore
Is reached at length, from which, ah, nevermore,
Shall the brave barque ride forth to meet the gale,

Or skim the calm with phosphorescent trail,
Or guide lost mariners mid the roar
Of hurricanes, or send, far echoing o'er
Some shipwrecked craft, the music of his "Hail."

And he has laid aside his travel gear;
And forth to meet him come the mystic band,
Whom he has dreamed of, worshipped, loved so long—
The veiled Immortals, who, with lofty cheer
Of exultation, take him by the hand,
And lead him to the inner shrine of Song!

International Electrical Exhibition.

An international electrical exhibition is proposed for the autumn of the current year, to be held in Boston, and the buildings in the Back Bay district have been examined for the purpose.

There is a much better chance for a first class electrical exhibition this fall than ever before, and, if the project is carried out, efforts will be made to have the display embrace the results of the labors of electrical inventors from all parts of the world, and to surpass the recent successful display in Paris.

The exhibition would remain open during the months of September and October.

When we consider that the annual meeting of the American Telephone Exchange Association, and also the annual "Old Timers'" Convention, both occur in Boston, in September, it will be quite clear that a brilliant season may be expected at the Hub; brilliant both physically and intellectually.

Telephonic Transmitters.

M. Salet has already published the description of several liquid telephonic transmitters, *i.e.*, of apparatus in which the oscillations of the vibrating plate cause a variation in the resistance of one portion of the circuit, which is liquid. He has given in the reports of the Academy his reasons for believing that these transmitters can reproduce the quality of sound more faithfully than Bell's electro-magnetic telephone.

M. Salet's first model utilized the variations in length of the electrolytic conductor obtained by making one of the electrodes vibrate. This is Graham Bell's method, but with this modification, that the oscillations of the electrode, being five times as great as those of the telephonic plate, gave much greater variations of intensity and more powerful sounds. The electrodes were very near together, and a metallic solution could not well be employed, as the deposit would soon have modified their distance. Acidulated water was therefore used, and the formation of bubbles caused an objectionable noise.

M. Salet then constructed a second telephone on a new principle. The electrodes were fixed, the liquid used was sulphate of copper, and the vibrations of the plate were utilized inclosing more or less the orifices of a kind of multiple slide-valve, working like those in steam engines, and serving to put into communication two vessels filled with the metallic solution and furnished with electrodes. By this means he obtained variations of section in the conductor, and consequently variations of intensity. This telephone gave rather good results, but it was difficult to construct, and presented, even when the orifices were covered, a somewhat strong conductivity, owing to the layer of liquid which always existed between the slide valve and its recess.

The following method, which figured at the Paris Electrical Exhibition, was then arrived at. A sheet of glass, arranged like the reed-stops in a musical instrument, was placed in direct contact with a rod coming from the center of a vibrating plate, and vibrated with it.

The channel of this sheet formed the bottom of a cell containing the sulphate of copper and a copper electrode; this cell was immersed in a receiver containing the same liquid and the other electrode. As before, the displacements of the telephonic plate modified the section of the conductor, and its resistance, only this resistance was very great (300 ohms on an average), and its variations very sensible. Whence resulted: (1) the possibility of producing a somewhat strong sound with few battery elements (5 cells Leclanche); (2) the lessening of the consumption of the battery; (3) and above all, the suppression of the induction coil for a line of less resistance than 40 kilometers. A button serves as reversing interrupter. If turned in the direction of the hands of a watch it puts the apparatus in circuit; if turned in the opposite direction, it interrupts the current; but if the first movement be repeated, it has the effect of re-establishing but reversing the current. Each electrode is therefore positive or negative by turns, and loses or gains in weight; in fact, it is not consumed. In a practical model since constructed, the vessels of sulphate of copper only contain 150 cubic centimetres of liquid; they are in the form of bottles; glycerine is added to the solution, and there is no need to mix water with it except for the batteries.

Important Telegraph Improvement.

A patent on an improvement in the art of railroad telegraphing has been applied for, that, if successful, will do away, so far as the regulating of the running of trains is concerned, with all local telegraph offices He claims that by his system, and with an operator on the trains, each train will be in instantaneous communication with every other train on the road, whether running at the rate of sixty miles an hour or standing still, or with the local stations, or the central offices of the road. He uses the continuous rail as a medium for the passage of the electrical current instead of the wire. If this shall prove a success one-half or more of the small offices could be abandoned, and a very large item of expense to roads saved. He also proposes to attach a galvanometer to each train, by means of which he can indicate accurately the distance between trains, thereby largely reducing the dangers of collisions. With his system of telegraphing the inventor gets a return circuit of metal, and can bid defiance to the effects of storms, that prove such a hindrance to work at times when the air is full of electricity.

The Microphonic Action of the Selenium Cell.

BY J. MOSER.

At the beginning of his researches the author shared the general view that there exist two kinds of photophones, and three kinds of light rays. He conjectured that the selenium photophone might give a clue to an immediate relation between light and electricity. His investigations have led him to the simpler conviction that a microphonic action is present in the photophone. The selenium photophone is in principle merely a microphone, and agrees most closely with that form which has been described as a thermoscope. Generally speaking the rays of light can produce modifications in selenium, but these are not essential for the selenium photophone. There exists only one kind of light rays, although of different wave lengths and intensities. One and the same ray can act thermically, luminously, and chemically, and it has only one kind of photophonic action. Hence the author sees no reason for distinguishing selenium from all other bodies on account of its photophonic action, and no longer entertains the hope of discovering in the selenium-photophone a new connection of the natural forces.

The New Accumulator of Messrs. Sellon and Volckmar.

Now that secondary batteries, whether containing new ideas, or merely consisting of slight improvements on well-known forms, are attracting so much attention in the electrical world, we feel that we cannot do better, in noticing the secondary battery of Messrs. Sellon and Volckmar, than to give first an advertisement emanating from Paris, and issued by the "Société Anonyme La Force et la Lumière" on the 24th of March, concerning the Faure accumula-

tors, and which advertisement has appeared in the London daily press.

It reads as follows:

"The Faure Accumulator.—*Notice.*—For some time past the advent has been pompously announced of a new Secondary Battery, said to be infinitely superior in capacity and durability to that of Faure.

"The construction of this Battery is perfectly well known to the undersigned, although it has not yet been shown out of the laboratory where it was made. It is neither better nor worse than a Faure Battery, inasmuch as it is a Faure Battery, made by discharged employés and workmen from the Faure factory in Paris.

"It is composed of perforated or corrugated plates of lead, on which are incrusted or intercalated oxides of lead, minium of litharge, lead dross, or finely divided or reduced lead. The professed inventor of this Battery (whose plagiarism will be proved at the proper time) naïvely imagines that by this process, which has been long ago described and employed, he can do without asbestos, felt, or other substances destined to serve as support to retain the reduced lead and peroxide in their places, and even goes so far as to minutely describe in his patent the details copied from the patent accorded to M. Faure.

"Finally, whether made with or without supports, these Batteries cannot be made in Great Britain or elsewhere without proper license and permission from the owners of the Faure patents."

The President of the Societe Anonyme La Force et la Lumiere.

Concerning the validity of these statements, which may or may not be true, we do not intend to discuss the matter at the beginning, but merely to state in the first place what we have seen. On the Friday evening previous to the visit of the Prince of Wales to the Crystal Palace Electrical Exhibition, forty of these cells were there shown in action, but only to a limited degree, as they had not been fully charged. However, during the following evening they were in full working order, and were considered to be the most satisfactory in their operations.

These secondary cells are made of various dimensions, the smaller ones having an internal capacity of $\frac{43}{100}$ of a cubic foot, the weight of metallic substance (?) in each being 62 lbs., and the solution consisting of 8 or 10 lbs. of acidulated water. As to the durability of these new cells, it is said that they will probably last for 12 or 18 months without attention, and then it will be only necessary to replace the positive plates, which may be done without destroying or disturbing the negatives. The facility for these repairs when necessary is very great. When looking at these cells, the difference between them and those of M. Faure is not at first sight very apparent, the only visible alteration being the absence of any felt or serge wrapping round the metallic plates, which are here kept apart from one another by slips of wood.

Each of these cells will give out for an hour 1 horse power of energy. We are told that the short circuiting of the plates, which is said to form one objection to another system, is obviated in these cells by their mechanical construction. The electromotive force per cell is given as 2.15 volts, and the internal resistance about 0.005 ohms. We are informed that the loss or leakage from these batteries when idle is very small. The larger cells will give out 5 horse power of energy for one hour, and the weight of each, including both metallic plates and solution, is about 300 lbs. It is claimed that by means of the Sellon and Volckmar secondary batteries about three times greater power can be obtained than is possible from the Faure system, weight for weight. These new cells can be seen in operation at the Crystal Palace, where they will be employed for producing the current to supply the incandescent lamps of Lane-Fox in the Alhambra Court. In reference to the construction of these cells, the details of which cannot yet be given, we are assured on good authority that they are quite different from those of M. Faure, and that the statements contained in the foregoing advertisements, if they refer, as Mr. Sellon supposes, to his accumulators, are therefore utterly unfounded. In fact, some of the Sellon plates were manufactured before the Faure patent was published. We are glad to be able to state that these secondary cells of Messrs. Sellon and Volckmar will shortly be laid before a scientific committee formed to consider the subject from all points. We would suggest that the test for loss or leakage when the cells are idle should have careful consideration for short and long periods of time. The Faure accumulator has already been carefully experimented upon in Paris by several well-known French scientists, and it will be highly interesting to compare their results with those obtained from the Sellon and Volckmar secondary cells, which we believe will shortly be available. In the meantime it appears that a real improvement in this branch of electrical science has been effected, but we have not yet seen sufficient of the new cells to speak confidently as to their ultimate value.—*Electrical Review.*

American Improvements in Rapid Telegraphy.

A most remarkable and ingénious invention in rapid telegraphic relays, has recently been patented in America to Mr. Gerritt Smith, which effectually overcomes all difficulties due to long lines. This relay is constructed upon the principle that the armature need only make partial strokes between the breaks due to the dashes and dots in the Morse system. An ordinary electro-magnet is placed in line circuit, whose core is adapted or caused to rotate by suitable mechanism. On the free end of this core, opposite the mechanism which rotates, it bears one end of a pivoted armature, whose outer end plays between contact points of a local circuit in the ordinary manner, and is provided with a well-known form of retractile spring, which tends to rotate the end bearing on the revolving core in a direction opposite that of said rotating core. When a current is set up in the electro magnet, the armature is drawn down against the smooth face of the revolving core, and carried forward until the local circuit is closed through it and the local contact points. If a series of dots are made, the armature falls back, but never during the series falls entirely back on its back stop. On this instrument Mr. Smith has been able to receive accurately, over 600 miles of line wire, 2,000 words per minute, and a perfect and accurate record is made on an automatic register in the local circuit. Mr. F. S. Pope, of New York city, assures us that there is now no doubt about the success of automatic systems over 1,000 mile circuits with this relay. If this is true, there will be a wonderful revolution in telegraphic systems dependent upon skilled Morse operators, and indeed that will become very soon a useless element in telegraphic business. These instruments will doubtless be used extensively in England, where automatic telegraphy seems already to be n the ascendancy, at least so thinks our American correspondent.—*Electrical Review.*

Underground Telegraphy.—The United States Underground Cable Company has been organized under the general laws of the State of New York, with a capital of $600,000, which is divided into 6,000 shares, with a par value of $100 per share. This company has contracted with the Société Anonyme des Cables Electriques, of Paris, France, for the purchase of the Berthoud-Borel patents for the United States, and it proposes to manufacture and lay underground electric cables, both for telegraphic purposes and lighting, and for telephonic purposes. The Société Anonyme des Cables Electriques will manufacture and ship full and complete sets of machinery for the purpose of putting into practical operation the Berthoud-Borel system in the United States, and will send skilled mechanics to explain and superintend the working of the same.

Plan of a Telemeteorograph.

By Dr. Paul Schreiber.

The author's proposed arrangement for what may be called an automatic and self-registering meteorological observatory consists of a barometer, two thermometers, a weather cock and a Robinson anemometer. One of the thermometers is protected against radiation and moisture, whilst the other is arranged as a wet-bulb instrument, or, as this might be difficult to effect, freely exposed. The apparatus records its own results upon rolls of paper by means of needles, every hour, and despatches them telegraphically once daily, or more frequently, to any required place.

The apparatus has not been brought into action, but all the principles of construction involved have met with application elsewhere, and have been found practical. The apparatus can work even under the most unfavorable conditions, whilst an interruption in the telegraphic communication has no influence upon the registration.

The Bottscher Telephone.

This is another new telephone, as remarkable for its simplicity as for the powerfulness of its effects This apparatus dispenses with induction coils and batteries, and owing to an ingenious mechanical arrangement, the receiver is as sensible as if it were microphonic. The apparatus consists of a cylindrical copper box, fourteen centimeters in diameter and five centimeters in height, in which are placed the component parts, and which is closed by a lid with a hole in the middle. To this lid, at the right of the orifice, is fixed a mouth piece for speaking into. The sounds emitted strike a vibrating plate screwed into the lid, the vibrations of which influence the magnetism of a magnet connected with the sides of the box by three steel wires, the tension of which can be regulated at will. The plan of the system can now be understood. The magnet is able, owing to the elasticity of the wires, to oscillate feebly in the direction of the vibrations of the plate when the latter approaches it, and as the magnetic action increases in proportion to the square of the distance, the amplitude of the vibration increases until the tension of the wires on the one hand and the elasticity of the plate on the other bring the attraction into equilibrium. On the contrary, as soon as the plate goes back the tension of the wires draws back the magnet, and the demagnetization takes place much more rapidly. By this means, therefore, we succeed in increasing the variations of magnetism in the magnet, and consequently a wire wound round the poles of this magnet produce much more energetic induction currents. We have here then a portable telephone, giving most satisfactory results, not easily put out of order, and leaving far behind it the Gower system and other similar ones.—*Ex.*

Effects of the Aurora Borealis at West Winsted, Conn.

During the beautiful electrical display by the Aurora Borealis last Sunday night the telephone wire in town were so strangely charged that the apparatus at the central office had to be cut out. Manager Hunt says that during the display they could probably have put aside their battery and operated the wires on atmospheric electricity alone.

Edison at Work.

PREPARATION FOR LIGHTING THE DOWN-TOWN DISTRICT.

The work of running the wires for the Edison lamps in the down-town district, bounded by Spruce street, Wall street, Nassau street, and the East River, is rapidly approaching completion, and the fitting up of the central station at No. 257 Pearl street, goes on at the same time with the laying of the street mains. The whole work of preparation may be divided into four branches: (1) the fitting up of the station for the plant; (2) the manufacture and installation of engines, dynamos, and other necessary apparatus; (3) the manufacture and laying of the street mains; and (4) the wiring of the houses. The work on the station, including a masonry foundation and a two-story iron framework for the machinery, and four boilers with a capacity for 1,000-horse power, is sufficiently advanced for the building to be ready for the six engines, six dynamos, and other apparatus. The engines were built by the Southwark Machine Co., Philadelphia, and are now in the hands of the Edison Machine Company; they have a total maximum capacity of 1,200-horse power. The six dynamos are nearly finished at the Edison machine shops in Goerck street. The weight of each dynamo is thirty tons. The boilers, when worked to their full capacity, will burn five tons of coal a day, and consume 11,500 gallons of water.

Up to the first of April, 55,300 feet of street mains had been laid of the 75,000 feet of main which will be required in all. The wiring of the houses was finished in February. In Beekman street 107 houses have been wired; in Fulton street 166; in John street 75; in Maiden Lane 78; in William street 97; in Front street 46; in Nassau street 68; in Pearl street 43; in Cedar street 36; in Pine street 28; in South street 24; in Ann street 31; in Spruce street 12; and enough in other streets to make 946 houses or business places wired ready for the lamps. The number of lamps to be put in is 14,311, of which 7,916 are of 16-candle power, the remainder of 8-candle power. The lamps were made months ago and can be put in at a day's notice. The central station will supply electric current not only for the lamps but also to run motors for elevators, and machinery of all kinds.

A New York Version of the Electric Light Stock Said to be Missing.

A director of the American Electric Light Company of New York said yesterday:

"The failure of the American Electric Light Company of Massachusetts, which claimed to be a branch of our company here in New York, is due to the action of Edward H. Goff, who attempted to buy what he couldn't pay for. He came to us last December and represented that he had a number of people well known among Boston financial men with him, and wanted the license for Massachusetts. Among others, he mentioned Special Sub-Treasury Agent Bingham, Mr. W. C. Hall, and Henry Hastings. The list of names was so strong that he made a favorable impression, though we knew nothing of Goff himself. He asked Col. Grant, who is a director in the company here, to act as President of the Boston company for one day, so that they could organize speedily.

"Col. Grant allowed his name to be used thus for one meeting. Then he wrote and formally withdrew. No notice was taken of his resignation, and Mr. Goff kept up the idea that he was still in. It was noticed that Mr. Goff was publishing advertisements in the papers, which would tend to give a false impression of the standing of the concern. Then some payments came due, and he failed to meet them. After this we discovered that he had had no authority to give us the responsible names he had given us. For two months we were pestered with letters from him, most of which I threw into the waste basket. Col. Grant refused to have anything to do with him, and wrote several times for an official acceptance of his resignation. His protests had no effect.

"The parent company here is flourishing. Its President is Mr. E. W. Andrews, and the Board of Trustees is Thomas C. Platt, William Windom, Col. Fred Grant, S. F. Moriarty, and H. R. Garden. The effect of the failure in Boston will be prejudicial to our interests, but as Mr. Goff, who failed a short time ago in another business, is well known there, the prejudicial effect may be light. We are informed that he sold what purported to be stock of our company, and if so, he will be prosecuted for it. The genuine stock is deposited with the Union Trust Company here in New York, and Col. Grant has never signed a certificate of it away to Goff."

BOSTON, April 23.—Vice-President Goff says that it was at the solicitation of Col. Fred Grant, Jesse Grant, and Director Stephen F. Moriarty that he was induced, and induced his friends, to go into the company. It was pointed out to him that firms of such standing as George William Ballou & Co., and Kiddle, Peabody & Co. were anxious to get the rights for New England. The Grants came on here, he says, to continue their solicitations. William McMahon, George Crosby, and E. M. Foxwell of New York, stockholders in the New York company, represented that Gen. Grant and his sons, Senator Windom, and Senator Platt were large stockholders in it. McMahon intimated that Jay Gould was the financial backer of the New York company.

Wm. McMahon said to-night that he was not disposed to settle the matter through the medium of the press, but rather in the courts of justice. In his opinion great wrongs and glaring frauds had been committed, and the evidence which would be forthcoming would show that those frauds were confined exclusively to the parties who had been so outspoken in denouncing others.

Mr. McMahon is known to have stated last night that he came on here from New York to see what had become of some $70,000 worth of stock unaccounted for.

On the other hand, Mr. Goff reiterates the statement that the 1,000 shares of Treasury stock are intact, and that the New York company can have it whenever they want it.

In answer to statements of the managers of the Boston company, the New York backers of the company, Messrs. E. M. Fox, Geo. Crosby, Stephen Moriarty, Wm. McMahon and others, make counter charges of fraud in the management and sales of stock on the part of the Boston officers. Legal complications, perhaps, in a criminal court will ensue.

Secondary Batteries.

On the evening of Tuesday last the directors of the Electrical Power Storage Company entertained at dinner in the Crystal Palace a large number of gentlemen interested in electrical science, and afterwards exhibited the capabilities of the new secondary battery of Messrs. Sellon and Volckmar, in its application to incandescent electric lighting, in the Alhambra Court of the Palace. Want of space compels us to leave over that which we would otherwise like to say; but we may add that the battery more than confirmed the good impression it had already produced, and all those present, the majority being eminent men in the scientific world, took great interest in the proceedings. In our next we shall hope to enter more fully into the matter.—*Ex.*

Vienna and Boston are the next on the list to hold Electrical Exhibitions next autumn.

Career of a Notable Mercantile House.

The retirement from business of the old firm of A. T. Stewart & Co. marks an era in the mercantile history of New York. Many of our citizens now in mature life well remember the humble beginnings of the man who afterward became the "Merchant Prince." With small capital, and but little business acquaintance, Stewart ventured to take half of a store on Broadway; opening with a fresh lot of Irish linens just from Belfast. We remember his own jocular description of the pine-board partition that separated him from his nearest neighbor. The short period of fifty-seven years, dating from 1825, has sufficed to witness the culmination, decline, and disappearance of the most powerful and prosperous mercantile firm New York has ever had. In the meantime the marble dry goods palace on Broadway was built on the site of the old Washington Hotel, corner of Broadway and Chambers street, also the six story building on Broadway and Tenth street—the latter property costing about $2,750,000—which structures were occupied successively for the transaction of the enormous business of the firm; meanwhile, too, the firm became extensive owners of mill property, for the manufacture of goods sold in the New York warehouse, all of which is now offered for sale. There are included three carpet and woolen mills at Glenham, which are still running; two mills at Leeds, Greene County; one each at Stuyvesant, Columbia County; Utica, Washington Mills, Little Falls, Woodstock, Vt.; Holyoke, Mass.; and Franklin, N. J. Other evidences of accumulated wealth are seen in the chapel and mausoleum at Garden City, L. I., and in the unfortunate "Woman's Hotel," on Fourth avenue, as well as in the beautiful marble mansion, to which Mr. Stewart removed on quitting the less pretentious abode in Bleecker street, with its stable entrance conveniently near to the front door, after the fashion in France. As to the place where the bones of the great merchant lie buried, it can be said, as of those of the ancient lawgiver of Israel, "no man knoweth to this day."

It has long been known that Mr. Stewart's successors were not successfully carrying on the business he founded and built up, and that the house had actually declined to a second or third place in the scale of mercantile greatness. Judge Hilton lacked neither capital nor confidence, but he lacked the mercantile ability of Mr. Stewart. His retirement from the unequal contest with difficulties which were too great for him, shows very clearly that A. T. Stewart's success was due to something else than his name, and that he has left no successor who can keep in motion the mighty productive and distributive system which, under his hand moved without jar or friction.

The exclusive governments of the Orient, like Siam and Corea, are yielding reluctantly, but perceptibly, to the march of modern improvements. Like China, the most stubborn opponent of progress, Siam is about to introduce the electric telegraph, a line being in contemplation between Bankok and the Cambodean frontier. French capitalists, of whom Lesseps is said to be one, also propose to build a canal across the Isthmus of Ksaw, shortening the distance between Calcutta and Hong Kong 900 miles, and it is believed the Government will approve. Should Prince Prisdang visit Europe and the United States, as proposed, there will be reason to hope that the last stronghold of Asiatic exclusiveness will be constrained to yield to a more enlightened civilization.

The new Himalayan railway in India is nearly 8,000 feet above the sea, and is fifty miles long. It presents the unusual characteristics in its construction of mounting gradients of one in twenty-one, and comes round curves of seventy feet radius.

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The rapid development of the telephone business has been unprecedented by any industry in the world's history, and has brought into play a greater diversity of inventive genius. Men with original ideas in different lines of thought have been pressed into the service, bringing with them new theories, which old experimenters with a snarling conviction have been forced to accept, and turning from well worn ruts into new channels have joined with alacrity in the general scramble for individual supremacy. The outcome has been not only the wonderful growth of the telephone interest but its effects have been extended into all branches of electrical science. The telephone was issued to the public without the necessary adjunct of switchboards, call bells, systems or apparatus of any kind, and each individual was left to work out his own telephone salvation. As a result of this there sprung into existence a great variety of systems, almost as many as there were exchanges, in fact, each different from the other in a greater or less degree, and we also found a host of telephone men, each vehemently proclaiming that his was the "great and only." This state of affairs existed until the convention at Niagara Falls brought them together, when a general interchange of ideas both in and out of the convention served to modify the opinions held by each. Since that time there has been a marked improvement in the construction of apparatus, and a general disposition to avail themselves of the good points then presented. The survival of the fittest is an inexorable law, and we know of no surer means of bringing them to light than the debate of rival interests, backed by a practical demonstration. We therefore favor the assembling together of telephone people, and we also believe in the journeyings of practical men, connected with exchanges as a means of perfecting the system.

Electrical disturbances are a source of great annoyance to users of the telephone, but are oftentimes caused by imperfect construction of lines; many profound theories relating to earth currents, induction and mysterious atmospheric influences may be upset by a soldering-pot and trimming shears in the hands of a good lineman.

With the utmost care it is next to impossible to make a perfect joint in the ordinary manner without the use of solder. There is no wire manufactured that does not possess a certain amount of "spring," and, when wound spirally, will not recoil to some extent. In the ordinary telegraph joint it may be imperceptible to sight or feeling, or even to the galvanometor, but the sensitive diaphragm of the telephone will discover it to the ear, and it will send off such effects in the most convincing manner. The presence of solder does not, of course, add to the conductivity, and, if introduced between the surfaces, would slightly impair it, but it is supposed not to reach the actual contact points, and therefore does not impede the passage of the current. Its functions are simply to hold the joint rigidly in place, and in this way to prevent the rubbing together of the surfaces when the wire is being swayed by the wind or placed under motion by any cause. The telephone, in response to an imperfect joint, will frequently send off the actual mechanical or musical vibrations of the wire as caused by the breeze.

The usual method of making a ground is to file the surface of the gas or water pipe, then strip the copper wire, and, winding it several times around the pipe, bind it firmly by twisting. Very good; now, the copper and iron are natural enemies, and when placed in contact and in the open air, will attack each other vigorously, which will soon result in the setting up of an insulated barrier which will effectually prevent communication. To obviate this, we must again have recourse to the soldering-pot; we should then seek out the gasmeter and run a wire across, cutting it out, electrically speaking, and now, as the boys say, we have "the bulge on the disturbance."

The New Telephone Corporation Organized.

The National Secret Telephone Company, capital $5,000,000, divided into 50,000 shares of $100 each, with the power to increase the capital to $10,000,000. The route of the line is from New York to Albany, to Buffalo, with the right and privilege to extend the route to other States and Territories. J. Harris Rogers, of New York, takes 39,994 shares. J. W. Rogers, Charles Ewing, Thomas Ewing, of New York; Frank Hume, of Virginia; L. G. Hine and E. C. Dean, of Washington, one share each.

New Quarters for the Mutual Union.

The Mutual Union Telegraph Company has leased the building at 135 Broadway, and will take possession on May 1. The ground floor was occupied by the American Union Telegraph Company till its consolidation with the Western Union, and a large operating department has been maintained there since. That department was taken into the Western Union building yesterday. The front portion of the ground floor will be used by the Mutual Union Company as its main receiving and delivering office, and the fourth and fifth floors will be occupied by the executive officers and operating department respectively. The company will continue a branch office at its present general offices, 47 William street.

A telephone company met and conquered unforeseen difficulties in laying an underground cable on Sunday, between Attleboro and Mansfield, Mass. The wires were to be buried along the line of a railroad; but the farmers of the region refused to loan their horses or oxen for Sunday toil, and the plow was accordingly attached by a beam to a locomotive, which did the work with a rush.

New Electric Light Company Organized.

The Swan Incandescent Electric Light Company for the Pacific Coast; capital $500,000.

Electric Light at Hell Gate.

The House committee has agreed to report favorably the Crapo Bill to place an electric light at Hell Gate. The bill appropriates $20,000.

The Mutual Union Telegraph Company have just completed their Southern line, via Washington and Pittsburgh to Chicago, and now have two lines in operation, the one from New York to Chicago via Buffalo, Cleveland and Toledo having been in use several months. They now have in all twelve wires between New York and Chicago.

Improved Combination Bell and Battery Box.

It probably goes without saying, that now nearly all subscribers to telephone exchanges are supplied with battery transmitters, and fortunately the battery requisite for the operation of these transmitters is neither excessively large or excessively costly, as if it were the transmitter instead of being universally used would be a luxury, employed only in isolated cases, where unusual volume of tone is required.

When we commenced first to use the transmitter we were generally so consummately and intensely satisfied with its wonderful work that we did not care about secreting the motive power, and, as for

the subscriber, he was then innocent enough to be pleased with anything that would talk loud enough for him to understand, and so when we connected his telephone in circuit, and gradually unfolded our intention to leave a cell of Leclanche battery in all its undisguised repulsiveness, as a corner ornament in his drawing-room, he made no objection, but rather, if we may so express it, hugged his chains, as indicating his scientific proclivities.

But the novelty soon palled upon this same individual, the average subscriber, and æsthetics resumed their sway in his breast, whereupon he demanded that the objectionable jar should be put out of sight.

No great objection could be made to this most reasonable demand, and accordingly the offending battery jar was stowed away in the nearest convenient dark closet, and wires run from that point to the transmitter, and again the clouds disappeared from the telephonic horizon. Not for long, however. The complaint is soon heard from all the points of the compass—"My telephone don't work as loud as it used to, what's the matter?" Why the matter is simply this, that electricity, though harnessed up to carry intelligence, is much like many other agents after all, and never likes to do more work than is necessary. You will never find electricity shedding tears because five o'clock has come and it must stop work. Looking into the matter, you will find that in some cases the closet where our connecting lineman has stowed the battery is clear at the other side of the house. Sometimes you will find the telephone in the garret and the battery in the cellar; other times the battery will be found upon a high shelf, so totally surrounded by dry day-books and ledgers, perhaps even containing the daily transactions of a dry-goods store; under such circumstances, can we be surprised if it does the only thing it can to get square, *i. e.*, "dry up."

I have heard men, who should know better, say that it doesn't matter if a transmitter battery *is* a good distance from the instrument—"chacun á son gout." Why not try it on a Morse sounder, and see? We will suppose a Leclanche battery having a force of say 10; we will further conceive of the normal resistance of the contacts and coil of a Blake transmitter as being 3 ohms, and call the internal resistance of the cell 2 ohms; the current in this case, we may say, has a value of 2—because we are imagining the battery to be so close to the instrument that the resistance of the connecting wires may be ignored. But suppose, now, that we have to remove the battery to some point at the remote side of the house, and that thus the resistance of the connecting wire with any joints that we may have to put therein is brought up to 5 ohms, the current is reduced to one-half its original strength and its value may be called 1. The values given here are merely illustrative, but they serve the purpose we have in view, and answer to point a moral and adorn a tale.

Thus we see there is a positive advantage to be gained by placing the battery as close to the transmitter as possible. In this emergency square boxes were at first suggested, and for quite a long time were very popular, but again the critical subscriber interposed and said that he didn't want an unattractive-looking black walnut box reposing in the corner of his room.

Another practical objection was that a great number of wires had, in this case, to be connected to a great number of binding screws by the constructing lineman.

Here an enterprising manufacturer stepped in and introduced a new feature, by setting up the entire apparatus on one baseboard—bell, transmitter, and battery box—and his example was quickly followed by other manufacturers, who believed that self-preservation was the first law of nature.

Quite recently a gentleman connected with the Suburban Telephone Company of Boston, J. B. Gardiner by name, realizing the truth and soundness of the foregoing ideas, has carried them out and gone a step further than any of his predecessors, by bringing the battery closer than ever to the transmitter. Gardiner fully believes that you cannot do a good thing too well. In his new style of apparatus he uses a baseboard, as heretofore, but cuts its length considerably, every diminution in length being an increase in symmetry. He makes it just long enough to accommodate a magneto bell and a battery box, and places the bell at the top and the box immediately below it. The door is made at one side and the front serves as a base for the transmitter, which is screwed thereon. Thus the battery is just behind the microphone, and its entire strength is therefore available; none of it being used up by traveling over office wire.

Before a lineman takes this set to a subscriber's office, every connection is made on the board, and all there is to do is to screw up the baseboard and connect the line wires.

TELEPHONY.—The paper on "Telephony" which should have been read by Lieut-Col. Webber before the Society of Arts, London, last week, is postponed till May 3d.

Iron ore is now being shipped both ways across the Atlantic. "Anything for ballast, and never mind the freight," is the word at present, among the ocean steamship companies.

The New and Cheap Battery.

In the *Review* of April 1st, an account was given of a new battery, which, as described, was certainly a marvel of cheapness. The same battery was also described in the English electrical papers, and the *Scientific American*, and appears to have attracted general attention.

The original description was given by an English gentleman, Mr. Alfred Bennett, the contriver of the battery; a gentleman who has devoted much of his time to the study of, and experimentation with batteries. It was based upon the fact discovered, I believe by himself, that in a strong alkaline solution—say a solution of potash or soda ash, iron was almost as strongly electro-negative to zinc as was carbon.

I have tried the said battery. I took an old tomato can, inserted in it an old porous cup, filled round the porous cup with iron borings, filled up the porous cup with a strong solution of potash in distilled water, inserted an old Leclanche zinc in the porous cup, closed it up with a wooden plug, afterwards sealing it with sealing wax. The entire cost, counting 10 cents for the potash, the only article for which money was paid, might be estimated at about 20 cents. In about two minutes from the time of setting up, the battery was connected up with a vibrating circuit breaker, and worked it smartly.

The circuit breaker constantly vibrating was kept on the battery circuit for 48 hours, without showing any diminution of strength; after which, on the 29th of March, the battery was set up on a regular Blake transmitter, with a switch whereby the circuit was always kept open, except when the transmitter was actually at work.

The immediate result on the transmitter was articulation not quite as loud as if a Leclanche battery was employed. It worked well for about two weeks and a half, after which the working effect became so weak, that it had to be taken off. It was, however, found even then, to operate an ordinary 2½ ohm vibrating bell strongly and loudly; and is apparently still good for a long time.

This is not to be regarded as a fair experiment, inasmuch as the porous cup was old to commence with, and possibly charged with salts, the zinc also was old, and the potash of the crudest character.

All things considered the result was more favorable than had been expected, and the battery is to be commended as a good one for those who like to experiment on their own account, for domestic electric bells, and may be very likely, by using new materials in its construction, found to give good satisfaction. It is proper to say here that I have since that time attempted to set up two more cells substantially on the same plan, and in them I have used as an exciting fluid a solution of Babbitt's concentrated lye. I have not yet succeeded in getting a current out of them, from some unexplained reason.

I may also state that I think, as it is necessary to the good working of this battery, that the air shall have free access to the iron; that it is a good idea to cut slits down the old can, and then place the whole in an outside vessel of glass or glazed earthenware, in order that the alkaline solution may not percolate through. T. D. LOCKWOOD.

The Crystal Palace Electrical Exhibition.

On Saturday evening, 1st ult., the Prince and Princess of Wales visited the Crystal Palace for the purpose of viewing the exhibition of the electric light, their presence bringing together a large concourse of spectators. The effect of the various systems in a building so eminently suited for such a spectacle was brilliant in the extreme, and the impression produced on those who were fortunate enough to be present will not readily be effaced. We have, on several occasions, made allusion to the probable objects of this exhibition, and have also compared it with that of Paris from another standpoint; and now, leaving out of the question any opinions we have formed on these matters, we may say that, as a sight, it is difficult to imagine anything more beautiful. The shortcomings and partial failures which necessarily occurred at the commencement of the lighting have been apparently rectified in almost every instance, and for an exhibition of such a character it may now be considered as complete as need be. On the evening we have referred to, every competitor appeared to do his best to outvie his neighbor, the result being most creditable and successful. A certain amount of dissatisfaction amongst the exhibitors, however, appears to prevail at the evident tendency on the part of those in authority at the Crystal Palace to bring into undue prominence the American element. This, however, is not altogether unwarrantable, for, owing to the completeness and extensiveness of their exhibits, it must be confessed that the methods of Brush and Edison are the most important of all the competing systems, both as regards extent and careful management, each being perfect in itself and not borrowing from other sources. We are speaking now of the manner in which the general public will look upon the exhibition, and, in order to be successful, it is necessary to study the prevailing ideas of the multitude. From a scientific point of view, there are doubtless several English systems of electric lighting equally worthy of consideration with those of Brush and Edison; but, as we have before mentioned, the scientific part of the question does not stand for much at Sydenham, therefore, those exhibitors whose apparatus may be possessed of the greatest merit, must not feel themselves slighted if their systems are passed by with merely a glance.

Returning to the exhibition as a whole, last Saturday saw several additions to the already numerous appliances. A number of Faure accumulators were shown in action and supplied the current for Edison's incandescent lights. Probably some idea of the lasting power of these secondary cells may now be obtained, a certain knowledge on this point being most

desirable. We believe that forty or more of the new secondary cells of Messrs. Sellon and Volckmar, of which we have heard so much recently, were also used publicly for the first time in connection with numerous incandescent lamps of the Lane-Fox type, for illuminating incandescent lights were most feeble. It does not appear at present, however, that this kind of lamp is lasting, for the filament may go at any moment when worked to such a high degree of incandescence. Although during the evening there were several instances of the ordinary incandescent lamps being destroyed, this was doubtless due to the occasion and the desire to show this system of lighting to the utmost advantage, by increasing the amount of current passing through them for the time. We have, however, sufficient proof that with ordinary care and attention incandescent electric lamps may be made to last for very long periods of time, and although we are only at the beginning of this new industry there are evident signs of great activity, which augur well for the future of electric lighting by this system. The arc will be used in many places where powerful lights are required; but we think that if our streets are ever generally lighted by electricity it will be by the incandescent method. Inventors are apparently taking leave of the arc lamps and concentrating all their energies towards the ultimate perfection of lighting by incandescence.

Should the exhibition at the Crystal Palace extend to a permanency, it ought and should be the means of greatly facilitating the general introduction of electricity for many purposes other than that of illumination. It is to be hoped that it may be made worth the while of the various competitors in electric lighting to keep up their exhibits and to add to them as new ideas are brought forward. The Crystal Palace directors have now in their hands the power of recouping themselves for the reverses of past years, and of conferring a great benefit upon the public at large, and if they act with discretion the exhibition may produce valuable permanent effects. In order to insure these it is necessary that the exhibitors shall have no cause for complaint, and this can only be done by giving equal facilities to all, and also by showing them equal attention. It looks, to say the least of it, as if the authorities of the electrical exhibition had more than a passing interest in certain systems, which are chosen for special examination and demonstration when the Crystal Palace is honored by visits from important personages. However, be that as it may, the exhibition has now assumed an importance which, although not international, yet is of a very creditable nature. It is worthy of remark that the public interest has shown itself so far, that several letters have appeared in the *City Press* to the effect that many thousands, whose only chance of seeing the electrical exhibition occurs on a Saturday, are obliged to forego the pleasure of a journey to Sydenham because they cannot afford the 2s. 6d. charged for admission on that particular day. It would be desirable on their part, if the Palace directors could see their way clear to extend the ordinary charge of 1s. to Saturday—say, once a month—if such a course would not materially interfere with their existing contracts with season-ticket holders. Or it might be advisable to keep the lights burning, say an extra hour, on certain Saturdays, and allow visitors to enter the Palace at the reduced admission after 8 o'clock in the evening. In the meantime, decidedly, the directors may congratulate themselves on the success attending their plans.—*Electrical Review.*

EDISON'S ELECTRIC BRAKE.—Mr. Edison has taken out a patent for an electric brake which consists essentially of a large horseshoe field magnet, much the same form as those used in his dynamo machines, but, instead of the ordinary armature, a disc on the axles runs partly between the cheeks of the magnetic poles, and when a circuit is made the disc, of course, revolves under a magnetic resistance, and so brings its axle to rest.

Electric Railways.

BY PROFESSOR W. E. AYRTON, F. R. S.

No. 2.

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The majority of my audience are probably accustomed to look upon electricity only as a means of moving little needles or ringing bells at a distance, but the success of the recent experiments on the electric transmission of power has turned the attention of engineers to the consideration whether electricity could not successfully supplant steam for the propulsion of trains and tram cars, at any rate on branch lines; whether it could not, in fact, supply an efficient means of transmitting power, the absence of which caused Stephenson quite rightly to abandon ropes in favor of a heavy locomotive. With electricity everything like a locomotive can be dispensed with, since every wheel in the train can be used as a driving wheel just as with the present continuous brake every wheel is used to brake the train.

The whole question, however, like every similar one, is mainly a question of expense; and what we have to consider is, whether electric transmission on the whole leads to greater economy than can possibly be obtained by the employment of any kind of locomotive.

But when I speak of railway trains being propelled by electricity, do not conjure up the notion of the trains going by themselves—like a witch on a broomstick. Power must be expended in giving speed to the train, and further power in keeping up this speed, and, although the expenditure of power will be much lessened by the absence of the locomotive, it will be by no means nought.

Indeed, to keep up a speed of forty miles an hour with ten carriages full of people, would require on a level straight line, even if there were no locomotive at all, an expendture of about 90 horse power. Now, power cannot be created. The total quantity of energy in the universe is perfectly constant, and all that we can effect is to devise machines for converting one form of energy into another.

In order, therefore, to propel a train along a rail way, we must either utilize the energy of coal by burning it, or employ the energy possessed by a mountain stream, or the energy stored up in chemicals and which is given out when the chemicals are allowed to combine, or the energy of the wind. Practically, we employ at present only the first store for propelling railway trains, the potential energy of coal, and that is, to a great extent, the store of energy that we shall still draw on even when we resort to electric railways. For electric energy can be produced by the burning coal, and can be produced more economically thus than in other ways. I start this gas engine, and an electric current is, as you see, at once produced, as is proved by the deflection of this galvanometer, but that electro motor on the other side of the room is also set in rapid rotation and works that lathe, thus showing that the electric energy conveyed along this thin flexible wire can do mechanical work. Here you have before you the whole process of the electric transmission of power from the burning of the gas on one side of the room to the turning of the lathe on the other.

I will now convert the energy stored up in this zinc into electric energy by burning it in the battery, allow it to pass along the other flexible wire, and at the other side of the room it is converted again into mechanical work causing this drill to be revolved at great speed, and enabling me to drill holes, as you see, upwards, downwards, or in any direction into this wood with the greatest facility.

Now, we want to consider the cost of producing power at a distance with these two methods. In the second case, the energy stored up in the zinc is converted directly into electric energy in the battery, without passing through the intermediate stage of heat; whereas, in the former, first, the coal is heated in the retort at the gasworks, producing waste No. 1; then the gas is burnt here in the gas engine, producing waste No. 2; next, the gas-engine works the magneto electro machine, producing waste No. 3; and, lastly, the motion of the magneto-electric machine generates the electric current, producing waste No. 4.

Now, how is it that the combined result of all these four processes, each of which is attended with waste, is more economical than the direct conversion of the potential energy of the zinc into electric energy? The answer is because, first, a pound of zinc only contains one-seventh of the energy of a pound of coal; and, secondly, because a pound of zinc costs 26 times as much as a pound of coal when bought wholesale, therefore, there is about 200 times as much energy in a penny worth of coal as there is in a penny worth of zinc. If then we can by this roundabout process of burning coal convert more than the $\frac{1}{200}$th part of the energy it contains into electric energy, this method of producing electric energy will be necessarily cheaper than the battery method. Experience shows that at the present day with the modern steam or gas engine and dynamo-electric machine from $\frac{1}{30}$th to $\frac{1}{15}$th of the energy in the coal can be converted into electric energy. Hence the mechanical production of electric energy is from 10 to 14 times as cheap as the battery method; and it is this successful substitution of the burning of coal for the burning of zinc that has constituted one of the greatest advances in electricity during the last few years, and which has now made electric lighting commercially successful.

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Matter and Magneto-Electric Action.

The late Prof. Clerk Maxwell, in his work on "Electricity and Magnetism," (vol. ii. p. 146), lays down as a principle that "the mechanical force which urges a conductor carrying a current across the lines of magnetic force, acts, not on the electric current, but on the conductor which carries it. If the conductor be a rotating disc or a fluid it will move in obedience to this force, and this motion may or may not be accompanied with a change of position of the electric current which it carries. But if the current itself be free to choose any path through a fixed solid conductor or a network of wires, then, when a constant magnetic force is made to act on the system, the path of the current through the conductors is not permanently altered, but after certain transient phenomena, called induction currents, have subsided, the distribution of the current will be found to be the same as if no magnetic force were in action. The only force which acts on electric currents is electromotive force, which must be distinguished from the mechanical force which is the subject of this chapter."

In the investigation on electric discharges, on which Mr. Moulton and myself have been long engaged, we have met with some phenomena of which the principle above enunciated affords the best, if not the only, explanation. But whether they be regarded as facts arising out of that investigation, or as experimental illustrations of a principle laid down by so great a master of the subject as Prof. Clerk Maxwell, I have ventured to hope that they may possess sufficient interest to form the subject of my present discourse.

The experiments to which I refer, and of which I now propose to offer a summary, depend largely upon a special method of exciting an induction coil. This method was described in two papers, published

in the *Philosophical Magazine* (November, 1879), and in the *Proceedings* of the Royal Society (vol. xxx. p. 173) respectively: but as its use appears to be still mainly confined to my own laboratory and to that of the Royal Institution, I will, with your permission, devote a short time to a description of it, and to an exhibition of its general effects.

The method consists in connecting the primary circuit directly with a dynamo or magneto machine giving alternate currents. In the present case, I use one of M. de Meritens' excellent machines driven by an Otto gas engine. The speed of the de Meritens' machine, so driven, is about 1,100 revolutions per minute.

In this arrangement the currents in the secondary are of course alternately in one direction and in the other, and equal in strength; so that the discharge appears to the eye, during the working of the machine, to be the same at both terminals.

The currents in the primary are also alternately in one direction and in the other, and consequently, at each alternation, their value passes through zero. But they differ from those delivered in the primary coil with a direct current and contact breaker in an important particular, namely, that while the latter at breaking fall suddenly from their full strength to zero, and then recommence with equal suddenness, the former undergo a gradual although very rapid change from a maximum in one direction through zero to a maximum in the opposite direction.

Medical Electricity.

A paper on "Measurement in the Medical application of Electricity," was read before the Society of Telegraph Engineers, by Dr. W. H. Stone and Dr. Walter Kilner. Dr. Stone commenced by stating that the subject had been suggested by Lieutenant-Colonel Webber, the chairman, and that the details the authors proposed to give that evening were mainly preliminary to fuller treatment, which they hoped to offer at some future period.

Medical electricity, he said, had been up to now a heterogeneous mixture of loose statements, doubtful diagnoses, and erroneous therapeutics. Glaring instances of these were given. With hysteria, Metallotherapy, and magnetic appliances, they did not propose to deal: science is in far too elementary a state to see through these obscure, though real phenomena. Probably, the key to the great enigma of the connection between electricity and nerve force had yet to be found. The bold statement that "electricity is life" is demonstrably false in many particulars. Speaking generally, medical electricity had suffered from its exclusive handling by physiologists and physicians, who might receive valuable help from physicists; indeed, the writers of the paper were actually soliciting such assistance at the hands of this young and active society. Medicine and its kindred arts lend themselves ill to measurement: the tone of mind required for their practice is rather judicial than computative; it is oftener concerned with weighing evidence, and balancing alternatives, than with solving equations. But men who work by measurement are usually sterling and accurate men; indeed, Prof. Schuster has recently shown how mathematics can help science. Where measurement *can* be used, it *should* be used; and this was their text for the evening.

The speaker then proceeded to divide the forms in which electricity had been used medically into four, namely—(1) continuous currents, (2) continuous currents made to intermit, (3) induced currents, termed generally "Faradisation," (4) statical electricity. The last of these was the first employed, but it had given the least satisfactory results of any. The third method had been far the most deeply studied. Duchenne's great work on Localized Electrization early drew attention to this department. That genuine and indefatigable observer was able to point out so many definite diagnoses, and to isolate so many new nervous and muscular diseases by means of the induction coil, that this instrument had been given somewhat excessive prominence as a therapeutic agent. Physiologists had also found in it a convenient stimulant for testing the action of nerves and the irritability of muscle; perhaps also the localization of brain functions. Hence muscular contraction and the action of intermittent currents in alternate directions had been too much relied on as evidence of activity. One chief object of the paper was to point out that the future of electro-therapeutics lies more in the continuous current, used either in its first or second form, the latter of which has hitherto received little or no attention. In confirmation of these views, extracts were read from Prof. Erb's valuable memoirs in Ziemssen's Cyclopædia of Medicine.

Fastest Steamer in the World.

The London *Times* of March 21, says the steamship Stirling Castle was tried in the Clyde on Friday and Saturday, and gave a speed which shows her to be the fastest ocean-going steamer in the world. In the course of a run of six hours, on Friday, she gave an average speed of 18.18 knots, and on Saturday six consecutive runs at the measured mile gave a mean speed, calculated on the Admiralty method, of 18,418 knots, or 21 3-10th miles per hour. The actual time taken in running each mile respectively was 3 min. 13 sec.; 3 min. 23 sec.; 3 min. 12 sec.; 3 min. 18 sec.; 3 min. 13 sec.; and 3 min. 18 sec. The vessel has been built for the China trade, and was tried with a cargo of 3,000 tons dead weight on board, ready for the voyage out. Her length is 430 feet, breadth 50 feet, and depth 33 feet, and she registers 4,300 tons. Her engines are the three-cylinder type, and they developed 8,237 horse-power. Some of the speed is due to the character of the propeller. It is made of manganese bronze, is 22 feet 4 inches in diameter, with a pitch of 31 feet. The maximum number of revolutions at the trial was 66½ per minute, accompanied by absolutely no vibration, except in the immediate vicinity of the screw shaft. The hull is built of steel, on plans approved by the Admiralty, with a view to national requirements, and is capable of carrying coal for a twenty-four days' cruise.

The opening of the Erie Canal was announced for the 11th inst., last Tuesday, but the first shipments reported were on the 12th, amounting to but 69,000 bushels, or about nine boat loads. The rates reported are 4½ cents for corn and 5 cents for wheat to New York, which, with the current lake rates, will make it cost about 7½ cents a bushel to send corn from Chicago to New York. Last year there were no shipments worth counting until May 20th, and then the rates were 6 cents a bushel for wheat, 5½ for corn, and 3¾ for oats, but within a week they fell to 5 cents for wheat and 4½ for corn. The rail rates from Buffalo to New York are reported as 9 cents a bushel for wheat, 8½ for corn, and 5 for oats, which is considerably more than the proportion of the 25 cent rate from Chicago to New York, that being only 7 cents from Buffalo to New York.

Ocean rates for some weeks have been extraordinarily low, ½d. to ¾d. per bushel having been commonly accepted from New York, and, it is reported, payments having been made by the vessels in a few cases for grain for ballast at Boston. The condition of traffic is such as almost to insure very low export rates for some months to come. The imports are large and the immigration enormous, and this brings great numbers of vessels to the Eastern ports, but the exports are unusually light, so that these vessels cannot get full return cargoes—the currents being the reverse of what is usual.

Pipe lines have superseded the railroads for shipments from the producing districts to such an extent that, out of 1,787,909 barrels shipped from these districts last February only 521,317 barrels, or 29 per cent., went by rail, and of this 101,644 barrels were refined oil, which cannot be forwarded by the pipe lines. Of the crude oil only 25 per cent. left the producing districts by rail, 35½ per cent. went by pipe lines to the refining centers at Cleveland, Buffalo and Pittsburgh, and nearly 40 per cent. by the Seaboard Pipe Line and the Tide Water Pipe Line.

The French military authorities lately announced a competition in design for a soldier's bed. It was stipulated that the bed should be capable of being raised against the wall, and in that position present a small table at which the soldier might eat, write, etc.; the new bed should allow of utilization of old ones; it should be as cheap as possible, and not need much repair, and it should afford no shelter to bugs (a great pest of the French army). More than a hundred models were sent in, and, after a large elimination about a dozen are on trial. Our contemporary, *La Nature*, in a notice of the more promising designs, gives final preference to a bed planned by Lieutenant Bertillon. In it a piece of canvas is stretched within or slightly above a rectangular frame, by means of a rope passing through sixty-four eyelets and round an iron bar parallel with the frame, which supports it. To obviate tearing, the eyelets are encased in pieces of leather attached to the canvas. There is a simple vertical frame at the head, and the support below, at that end, consists of two bars, bent into a shape like that of the lower half of a broad capital D, the vertical part having a board attached, which serves as a table when the bed is tilted up on the curved bars against the wall (an easy operation.) The support at the other end is a two-legged stool or short form, on which the soldier can sit at the table. The arrangement seems very convenient and suitable to the object proposed.

Reclaiming the Zuyder Zee.

According to recent reports, it seems to have been definitely determined to reclaim the Zuyder Zee, Holland, whereby a large tract of land would be rendered available for agricultural and other purposes. The engineers in charge of this work have been engaged for ten years past in preparing the plans, and the total cost is now estimated at not less than $46,000,000. The dyke will be about 24½ miles in length, and will extend from the city of Enkhuisen to the coast of the province of Overyssel. The top of the dyke will be built to the height of 16 feet above the level of the sea, which will bring it about 6½ feet above the highest tide. The dyke will be formed from sand and faced with clay, and will be built of sufficient dimensions to resist the heaviest seas. It is intended to commence operations on the work at four different points, and the calculation is to have it completed in from seven to ten years.

An ingenious method of arriving at an estimate of the numbers of children who succeed in evading the compulsory by-laws of the School Board has been adopted by the Ragged School Union of Liverpool. A band of music was hired to play for two hours a day during school hours in different parts of the city, and a record was kept of all the juveniles who were attracted by the music. In four days they counted no fewer than 3,020 children of school age, for the most part squalid and ill-fed, standing round the band at a time when they ought to have been at school.

Electric Transmission of Power.

Sir W. Thomson showed, in his inaugural address last year to the British Association, that if it were desired to transmit 26,250 horse power by a copper wire half an inch in diameter, from Niagara to New York, which is about 300 miles distance, and not to lose more than one-fifth of the whole amount of work —that is, to deliver up in New York 21,000 horse power—the electromotive force between the two wires must be 80,000 volts. Now, what, asks Professor Ayrton, is to be done with this enormous electromotive force at the New York end of the wires?

The solution of this problem, he says, was also given by Sir W. Thomson on the same occasion, and it consists in using large numbers of accumulators. All that is necessary to do in order to subdivide this enormous electromotive into what may be called small commercial electromotive forces, is to keep a Faure battery, of 40,000 cells, always charged direct from the main current, and to apply a methodical system of removing sets of 50 and placing them on the town supply circuits, while other sets of 50 are being regularly introduced into the main circuit that is being charged. Of course this removal does not mean bodily removal of the cells, but merely disconnecting the wires. It is probable that this employment of secondary batteries will be of great importance since it overcomes the last difficulty in the economical electrical transmission of power over long distances.

Importance of Charnay's Discovery.

A reporter of the *Tribune*, in an interview with Mr. Rice, editor of the *North American Review*, yesterday obtained some additional particulars relating to the discovery by Mr. Charnay of "The Phantom City" in Guatemala. Having been asked in what sense the term "Phantom City" is to be understood, Mr Rice replied that the most satisfactory answer to the question would be an account of the way in which this city was first brought into notice.

"Upward of forty years ago," said he "when the distinguished American traveler, John L. Stephens, visited the village of Santa Cruz de Quich, Guatemala, he learned of the existence of a great inhabited city in the Sierra de Guerra (land of war,) the region in the northwestern part of Guatemala occupied by the Candones or Lacandones, a tribe of people said to this day to perpetuate the traditions and the mode of life of their Maya forefathers. Though nominally subject to the laws of the Republic of Guatemala, the Lacandones are in fact absolutely independent and jealously refuse white men entry into their settlements. Stephens thought that a force of 500 men would be necessary in order to overcome the resistance of the natives to the intrusion of an exploring party. Whether Mr. Charnay, the chief of the expedition, had to employ so strong a force as this, I cannot of course say, but if such force was required he no doubt had it at command, orders having been given by the Government to the commandants of the several garrisons to furnish him a sufficient escort. But to return to the 'Phantom City.' Mr. Stephens was assured by the *cura*, or parish priest, of Quiche, that he himself, while still a young man and living in the village of Chajul, had climbed to the summit of a bare and lofty peak of the neighboring sierra, and had then, at a height of ten thousand or twelve thousand feet, looked over an immense plain, extending to Yucatan and the Gulf of Mexico, in the midst of which, at a great distance, he saw a large city spread over a considerable space, with turrets white and glistening in the sun. This place was, according to the *cura*, 'a living city, large and populous.' From other sources Stephens learned that from the Sierra a large ruined city was visible; while others, who had climed to the same elevation had seen nothing, owing to a 'dense cloud resting on it.' Later writers pretty generally relegate this city to the class of phantoms and mirages, or of fables. But in itself the *cura's* story is in no wise improbable, for there are throughout that entire region, in Guatemala, Yucatan, Chiapas, Tabasco, etc., to be seen, in ruins, it is true, hundreds of places, cities, which, while they flourished, must have presented just such an appearance as that described by the old *cura*. And it is worthy of note that Stephens —an embodiment of common sense, an explorer who had never a pet theory to support—saw no reason to doubt the truth of the padre's story. And now Mr. Charney has found this city, though, of course, we cannot as yet affirm that he found it 'living and populous.'"

"What special significance attaches to this discovery?"

"The best reply to your query can be made in almost the identical words of Stephens. If that city is still inhabited, then a place is left where Indians and an Indian city exist as Cortez and Alvarado found them; there are still living men who can solve the mystery that hangs over the ruined cities of America, perhaps; who can go to Copan and read the inscriptions on the monuments? You know what absurdities have been published about the age of these monuments, these cities. Brasseur de Bourbourg makes them antedate 'the Flood,' and Dr. Le Plongeon is satisfied that some of them are at least 17,000 years old. Mr. Charney has stubbornly maintained that the oldest of them date from a period not anterior to the eleventh century, that many of them are of still later origin, and that nearly all of them were flourishing at the time of the Spanish invasion. It concerns every student of American history to have this vexed question settled beyond dispute, and Mr. Charnay's discovery promises to supply the 'missing link' which connects the founders of these Central American cities with the present indigenous populations of the same region."

"When do you expect to receive a detailed account of Mr. Charnay's discovery?"

"Mr. Charnay's journal, in which he notes every step made in pursuing his explorations, is doubtless now on its way from Guatemala by courier and Post."

Plow for Laying Electric Cables.

Electrical communications are constantly multiplying, and this movement is seen every day increasing in rapidity. The invention of the telephone, and its more and more frequent applications, has neeessitated the laying of very numerous conductors, and is constantly requiring a greater quantity of them. In such installations air lines will probably be in the majority, since they are economical, easily put up, and readily watched. But on another hand, they are exposed to the inclemency of the seasons and to being tampered with by malicious persons, and are subject to get out of order. It is certain, then, that in many cases subterranean lines will be employed. The principal drawback to these latter is particularly that of their greater cost. The cables need careful insulation, and putting them in place is quite a laborious operation. The latter offers particularly the inconvenience that, in addition to expense, it requires time. In certain cases, in war, for example, a great advantage would accrue from the use of subterranean lines, but it is rarely possible to lay them, since there is no time to do so.

Instruments adopted for facilitating and hastening the operation of laying underground cables have been invented, and these naturally present themselves under a form similar to that of a plow—the principal work being to open a sufficiently deep trench. This is the operation that is really onerous, and it is because of the cost of it that hitherto subterranean lines have been employed only in cases where several of them could be laid in the same trench. At the recent Electrical Exhibition there were shown two types of plows adapted for the purpose just indicated. One of these, in the German section, was light and incapable of reaching much depth. There is reason to believe that it was invented principally for military purposes, and that it was designed to quickly lay a temporary line. Such being the case, the utility of the instrument is not very great, for the chief interest is to have an apparatus capable of laying a permanent line. And such is the object obtained by the other plow that the Exhibition has shown us, and which is the invention of a French engineer, Mr. Jules Bourdin.

The manner in which it operates will be readily understood. A lenticular disk precedes the share, cuts the roots, and, in a word, opens the trench. The share is provided behind with a bent tube, and lays the cable at the very bottom of the ditch that the compressing roller in the rear afterwards closes. The machine carries a windlass frame designed for holding the coils of wire, and necessitates the attendance of but few men. The instrument is simple, strong, and well got up, and it ought to give good results. The inventor has taken care to reduce the trench to a minimum in width, while at the same time giving it a depth which, it appears, is about a meter. The circumstances that led Mr. Bourdin to devise the apparatus under consideration are quite curious. A few years ago he had to locate a system of telegraph lines between the different factories and shops that lie scattered over the domains of a wealthy and active Russian property owner, General de Maltzoff. It seems that in that country it is very difficult to preserve aerial wires. The peasants have some respect for lines belonging to the government, as it would cost too dear to touch them; but private lines are constantly being damaged by them, for they do not hesitate to take the wires at any time to mend a broken cart, or for any other similar purpose. It becomes absolutely necessary, therefore, to have recourse to underground lines, and it is of the utmost importance to lay them by some means that shall prove as expeditious and as inexpensive as possible. This is why Mr. Bourdin sought to solve the latter problem by the use of his plow, and it was by the aid of this apparatus that he performed the work intrusted to him.

As regards the speed with which cables may be laid by this means, we are enabled to give some account of it from information furnished us by an agriculturist. An ordinary plow, drawn by three horses, and always moving in a straight line, can make, according to his estimate, four kilometers per hour at a maximum, the furrow opened being thirty centimeters in depth. This speed could not be much exceeded even in very mellow soil, since it represents the maximum speed of horses while walking; and it is not possible to plow on a trot. However, by increasing the power of traction, the special arrangements of the wire-laying plow ought to permit the speed to be increased a little and to reach at least five kilometers per hour; and such, in fact, is the speed reached by the inventor during the work done by him in Russia. The difficulty of plowing deep resides especially in the resistance of the subsoil; and the depth of the superficial layer determines the maximum depth of the former. Very often this depth will not have to be very great; but cases will occur in which the laying of subterranean cables will be greatly facilitated by the use of the plow that we have jnst described.—*La Lumière Electrique.*

ELECTRICITY FROM THE OCEAN'S WAVES.—Engineers have been examining the ends of the Coney Island piers, with a view of trying the experiment of having the electricity for the lights upon the piers generated by the action of the waves upon an apparatus devised for the purpose.

Telegraphic and Telephonic Notes.

The New German Cable.

MESSAGES EXCHANGED AT THE OPENING OF DIRECT TELEGRAPHIC COMMUNICATION WITH GERMANY.

BERLIN, April 22.—The new cable connecting Emden with the Anglo-American cable system at Valentia, thus enabling messages to be transmitted directly between Germany and America, was opened to-day with the following message from the Emperor to the President of the United States:

"I am very happy to express to you, Mr. President, by the first direct telegraphic communication between Germany and America, my satisfaction on the completion of the work by which the friendly relations between the two nations will be more closely cemented."

Dr. Stephen, Chief of the Postal and Telegraphic Department, presided at the opening ceremonies at Emden.

WASHINGTON, April 22.—The following is President Arthur's reply to Emperor William's greeting on the opening of direct communication by telegraph between Germany and the United States:

EXECUTIVE MANSION,
WASHINGTON, April 22, 1882.

To His Majesty, William, Emperor of Germany:

"I have received with much satisfaction, as the first dispatch over the new line of telegraph between Germany and the United States, your Majesty's kind message. In common with all the people of the United States, so many of whom still speak the German tongue in their homes, I share in the pleasure which your Majesty expresses at the opening of this new line of communication, and in the faith that it will serve to promote the friendly relations which we desire, and which it will be my aim to preserve and increase. CHESTER A. ARTHUR,
President of the United States."

The following dispatches were also sent from and received in this city on the opening of telegraphic communication between the United States and Germany. Dr. Norvin Green, President of the Western Union Telegraph Company, sent the following message:

Weaver, London:

"Please accept and present the cordial congratulations of the Western Union Telegraph Company on the completion of the Emden-Valentia submarine telegraph cable, as another grand stride in the progress of this modern means of rapid intercommunication now so absolutely essential to commerce, and our united rejoicing in its opening this day for business. NORVIN GREEN, President."

In reply to which Dr. Lazard, the Managing Director of the German Union Telegraph Company, sent the following:

Norvin Green, President of Western Union Company:

"Please accept my best thanks for your kind congratulations. They will be conveyed to Dr. Stephen at our dinner this evening. DR. LAZARD."

Mr. Cyrus W. Field sent the following:

Dr. Lazard, Managing Director of the German Union Telegraph Company, Emden, Germany:

"I congratulate you on the completion of direct telegraphic communication between Germany and America. There were many ties to bind the two countries together before; this is another to bind them closer and stronger. May it never be broken. CYRUS W. FIELD."

To which Dr. Lazard replied in terms similar to his message to Dr. Green.

The Emperor's message was transmitted to Washington in nine minutes, and the President's reply in a fraction over ten minutes.

The tariff between the two countries will, in virtue of an exclusive agreement between the German Union Telegraph Company and the Anglo-American Telegraph Company, be equalized with that of Great Britain and France.

The New Telephone Co.

A meeting of stockholders and directors of the Hudson River Telephone and Telegraph Co.—the new organization which has succeeded the Automatic Signal Telegraph Co. in the control of the telephone business in this vicinity—was held in New York on Thursday, to complete the organization.

The following were elected Directors to serve for the present year:

H. L. Storke, of N. Y.
Dexter A. Smith, Auburn, N. Y.
James Bigler, Newburgh.
S. K. Rupley, Poughkeepsie.
John I. Platt, Poughkeepsie.
Fred E. Storke, Auburn.
Geo. E. Baker, Akron, O.

James Bigler was elected President, John I. Platt, Vice President, and H. L. Storke, Secretary and Treasurer.

New and perpetual contracts were presented and executed with the American Bell Telephone Company, by virtue of which the new company acquires full control of the Telephone business in all its branches in the counties of Dutchess, Putnam, Orange, Sullivan and Delaware, with the right to establish Exchanges at any point in the territory, to lease telephone for private lines and other purposes, and to establish communication by telephone between any points within the counties named. These contracts confer important powers and privileges not heretofore possessed, and will enable the company to increase largely the facilities offered to the public. It is generally understood that the Bell Telephone Co. has been for some time past experimenting with a new instrument, especially adapted to long distances, and though its managers have refrained from making public the results, there is little doubt that success is practically assured. The telephones now in use work admirably for short distances, and when properly adjusted, carry the voice with perfect distinctness for 20 to 25 miles, but even then they are not always to be depended upon, and they are peculiarly sensitive to outside influences which produce sounds of their own and interfere with the words uttered. Between this city and Fishkill, for instance, the telephone works well, but between here and Newburgh it has not been entirely satisfactory. The new telephone, however, as those who have tried it declare, overcomes these defects, and conversations have been carried with ease between Boston and New York. As soon as they can be perfected these instruments will be furnished for the use of the public, and we think we can promise confidently that before long subscribers in this city will be able to talk with New York, and with other important points, as well as between themselves.

Mr. H. L. Storke, who will act as the General Manager of the new Company, is a man of great executive ability. The Company has sufficient capital, and no pains will be spared to improve the service, and make it satisfactory to all.

The Telephone for Finding Springs of Water.

A new use for the micro telephone has been devised by Count Hugo Von Eugenberg, at Caslle Tratzberg, in the Tyrol, namely, for findnig underground watercourses. At several different places on the declivity of a hill, he buries a number of microphones in the soil, and connects each of them with a battery and a separate telephone. In the night, when other sources of disturbances are wanting, or less noticeable, he listens at the telephones, and is enabled to detect in this manner the faintest murmur or gurgling of water within the earth to a considerable depth. The microphone plays the part of the sensitive ear of hunter or savage, who is often able to detect the presence of water in the same way.

To the Editor of The Electrical Review:

SIR,—In my former letters I have endeavored to establish the propositions that the telephone receiver will reproduce human speech when such receiver is actuated by a make-and-break current, or a current of the nature of a make-and-break current; and it is now necessary to consider whether such a current is, or can be, transmitted by a hard carbon microphone when articulate speech is being transmitted. I assume the following premises, and as they are truisms in terms, I apprehend that they will not be questioned. First, "make" is "make" and "break" is "break;" second, "contact" is "contact" and "no contact" is "no contact"—that is to say, if two substances touch one another they do touch one another; and if they do not touch one another there is some space, however small, between them.

Edison's claim is for the "combination with a diaphragm or tympan of electric tension regulators substantially, as hereinbefore described, for varying the resistance in a closed circuit;" and it is quite clear that any instrument working by make-and-break is not within his claim, as set out above. Moreover, if Edison's soft carbon transmitter works by make-and-break, it is really only Reiss's old transmitter with carbon substituted for platinum. It is consequently necessary that Edison should maintain that his transmitters work only as tension regulators in a closed circuit; and, in order to bring the hard carbon microphones within his patent, he has to allege that they also act only as tension regulators in a closed circuit.

A reference to Edison's patents and to the published accounts of his inventions will show that, up to the time of Hughes' discovery of the microphone, Edison was working on the basis of the varying resistance of substances when under pressure; and he probably was led to do this from a belief in Bell's account of his undulatory current. Prescott, in his book on the telephone, gives descriptions of a large number of Edison's instruments; and, apart from the telephone apparatus, it can readily be seen that Edison's micro-tasimeter and his carbon rheostat are both based on the varying resistance of soft carbon when under pressure, and that it was the varying resistance of substances when under pressure, and that only, that was engaging his attention prior to the discovery announced by Hughes. That Hughes may have been made aware of the nature of Edison's investigations, and that it was in pursuing those investigations that Hughes discovered the microphone, is very likely; but it by no means follows that Hughes' hard carbon microphone works in the same manner as Edison's soft carbon telephone transmitter. When Hughes exhibited and explained his microphone before the Society of Telegraph Engineers and Electricians, Preece said that he believed that the microphone worked by loose contacts. Now, "loose contacts," is a loose phrase; it is capable of several different meanings, and would cover the mode of action now attributed to Edison's soft carbon telephone, as well as that of the make-and-break transmitter of Reiss.

It has long been known that all hard carbon microphones oxidize at the points of contact; but as far as is known, the passage of the current through a piece of hard carbon will not cause it to oxidize, unless the current is strong enough to raise it to a very high temperature, whilst the oxidation at the points of contact in a microphone takes place without any perceptible rise in the temperature of the

carbon. If the microphone is so sensitive that a spark can sometimes be seen at the contact points, this oxidation is very rapid; and even in a microphone, which is not very sensitive, and in which a spark cannot be seen at the contact points, the oxidation takes place after only a few hours' use; and in a microphone in which the contact is made between a flat surface and a knife edge, the oxidation assumes the appearance of a reddish-brown line on the flat surface of the carbon, and when this oxidation has proceeded to some extent, the microphone ceases to act.

The extent of the movements which sound vibrations produce in different substances has been measured, and it has been demonstrated that sound vibrations do produce a movement in the surface of a body through which those sound vibrations are passing, or against which they strike. It has also been repeatedly demonstrated that the voltaic current will not pass over any break, however slight, that there may be in a circuit, unless such voltaic current is of very high intensity, and unless contact has been made, when, on the circuit being broken, an arc is, with a strong current, formed; but when the arc is formed, the current continues to pass, and a current so passing is not that described by Bell as an undulatory current. Yet with these well-known facts before us, facts which it appears to me will fully explain the action of the microphone and telephone when transmitting and reproducing human speech, it is sought to establish new theories, which theories are, if I am right in my views, unnecessary as explanations of the action of the microphone and telephone, are inconsistent with well-known facts, and are utterly unsound in their nature.

The mode of action of the soft carbon telephone was not, at the recent trial, in dispute between the parties, but it was contended that the hard carbon microphone worked in the same way; and it was decided by Lord Maclaren, mainly on the evidence and opinion of "the most eminent electrician in the United Kingdom," "that the principle and mode of action of Edison's tension regulator and that of the respondent is one and the same. If the respondent's surfaces vary the resistance by make-and-break, so must Mr. Edison's." The above assumption is a simple one; it means, I do not understand the instruments, but "Cæsar and Pompey are very much alike, especially Pompey." The assumption is, however, altogether incorrect on the face of it; for if the microphone transmitter works by make-and-break there is not any varying of the resistance in the circuit, but there is an absolute cessation of the current in each break, and an instrument so working does not vary the resistance in a closed circuit and is consequently not claimed in Edison's patent.

It appeared to me, on reading the evidence given for the complaining company, that if their explanation of the action of the microphone was correct, substances that would yield slightly to pressure might be made good microphones. I therefore made a microphone of two pieces of wood at right angles to one another, and in the vertical piece fixed, at a distance of about an inch apart, two pieces of $\frac{3}{8}$-inch brass rod, each about $\frac{3}{16}$ long. In the bottom one a small hole was made with the point of a drill, a little longer than the mark of a center punch, and through the other was drilled a hole about $\frac{1}{8}$th of an inch in diameter. The edges of this hole were cut away in the lathe, so that anything put through this hole would touch in the middle only. These pieces of brass were tied to the vertical piece of wood by copper wire, the piece with the hole through it being at the top, and a terminal connected to each piece, so that any conducting substance put through the upper piece of brass, and allowed to rest in the drill mark in the bottom piece, would complete the microphone. The vertical piece of wood carrying these brasses moved on a pivot, so that it could be set at any angle, and the pressure of the rods or wires thereby altered. It appeared to me also that if the view that the microphone acts by the compressibility of the substance of which it is constructed is correct, it would follow that a microphone composed entirely of brass should act better than a microphone of precisely similar design composed of hard carbon; whilst if the view that the microphone acts by make-and-break is correct, a microphone made of brass would do little more than transmit some of the lower notes, and the power of a microphone to transmit the higher notes would increase as the substance of which the microphone was made increased in hardness, and consequently decreased in compressibility.

I tried the microphone described above by putting thin rods of the various substances, pointed at one end, through the hole in the upper brass, and allowing them to rest in the small hollow in the lower brass. The following were the results, Brass and brass produced the lower notes of a musical box, with only one or two of the higher notes, a Bell telephone being sometimes used as a receiver, and at other times one of the little electro-magnet receivers; iron and brass produced the lower notes better than before, and a few more of the higher notes; steel and brass was a great improvement, and carbon and brass a further advance; but still the reproduction was very unsatisfactory, and the tone in the telephone unpleasant. One of the rods used consisted of a sewing needle, and when this needle was threaded, and the thread allowed to rest on the wood of the microphone, no sound at all was produced in the telephone. With none of these materials was speech reproduced, and only a few tones of the human voice. I then removed the two pieces of brass from the vertical plate of the microphone, and substituted two pieces of hard carbon, prepared in a manner quite similar to, and of the same size as, the brasses, and the results were that brass and carbon were about similar to carbon and brass; iron and carbon a great improvement; steel and carbon a further improvement; and carbon and carbon as good an articulating microphone as any one could desire. It has recently been stated several times in the *Electrical Review* that hard carbon does not vary in its resistance when under pressure; and it will be seen from the foregoing experiments that the transmitting power of the microphone gradually increased and improved as the substances of which the microphone was composed were harder in their nature—that the worst substances were brass on brass, the softest and the most compressible of the substances—and that the best (indeed its articulation was so clear that I may say it was a a perfect microphone) was the one constructed of the hardest and most incompressible of the substances. In each of these experiments, by attaching a thread of cotton to the rod, and allowing such thread to rest on the wood of the microphone, the transmitting power at once ceased, showing apparently that unrestricted motion is necessary in one piece of a microphone, although the motion required is infinitesimally small, and that if the parts of a microphone are kept in contact, such microphone will not work; whilst if the hard carbon microphone works as a tension regulator in a closed circuit, unrestricted motion is not necessary, and the retention of the parts in actual contact would not only be an improvement, but would be a condition essential to the ability of the microphone to transmit human speech.

I think it is clear that the current generated by a Bell telephone, when acting as a transmitter, is not of the nature of the current described by Bell as an undulatory current, nor is the current transmitted by an induction coil; and as the telephone receiver will act with these currents, which are both of the nature of make-and-break currents, and will when so acting reproduce human speech, it would follow that, unless there is some other cause to prevent it, human speech may be transmitted by a microphone acting on the make-and-break principle. If I have shown this to be the case, and that all the variations in the amplitude of the vibrations of the armature plate of the telephone receiver, which armature vibrates under restraint, can be produced by a make-and-break current, I have succeeded in the object that I had in view when I commenced these letters.

I may, before concluding, mention that the cup-and-ball microphone may be reversed in its construction; that is, insread of two conical cups and a round ball, you may use two conical pegs and a ring—the pegs being cut out of $\frac{5}{16}$, and the ring out of $\frac{3}{8}$-inch carbon rod.

I am, sir, your obedient servant,

H. B. T. STRANGWAYS.

The Action of the Telephone.

To the Editor of the Electrical Review:

SIR—With reference to Mr. Strangway's query as to how to "send through the primary coil a current whose strength continually and uniformly diminishes or increases," and "which is clearly, unmistakably, and indisputably that which Bell describes as an undulatory current, and not a mere series of impulses," Mr. Strangways has only to insert in the primary circuit of the induction coil a Jacobi's rheostat, with fine platinum wire on it, and he will have the means of effecting the continual variation of the current. By turning the cylinder of the rheostat rapidly the resistance in the circuit will be increased or diminished rapidly, and by turning it slowly the resistance will be varied slowly. If the secondary coil is connected to a sensitive galvanometer, a permanent deflection will be obtained, which will vary in degree according as the rheostat cylinder is rotated fast or slow; and the direction of the deflection will vary according as the rotation of the cylinder produces an increase or a decrease in the current. Mr. Strangways says in his last letter: "I have carefully watched the effect of the current of a Bell telephone, used as a generator, in a very sensitive reflecting galvanometer, and, in my judgment, the effect on the galvanometer is produced by a series of impulses, and there is not a continuous current." By this, I presume, the writer argues that the movement of the diaphragm, either towards or away from the pole of the permanent magnet, produces only a so-called momentary current. Suppose, now, we make the following well-known laboratory experiment: Take a straight bar electro-magnet, and connect it to a sensitive galvanometer; now approach a powerful permanent magnet towards the end of the iron core, and the result will be that we shall get a deflection of the galvanometer needle; if we next make the magnet recede from the iron core we shall get a deflection in the opposite direction. Now, if the currents causing the deflections are only momentary, I would ask at what moment do they commence to circulate according to Mr. Strangways? Suppose the permanent magnet is at starting at a distance of four inches from the end of the core, and when it is brought close it is at a distance of one-eighth of an inch, does the current circulate only at the moment when the magnet reaches its minimum distance from the pole, or at the commencement of its movement from the distance of four inches, or at some intermediate point? If Mr. Strangways will make this experiment he will find that the needle of the galvanometer commences to move when the permanent magnet commences to approach the iron core, and will deflect more and more as the magnet approaches nearer, the limit being reached when the magnet is closest to the core; moreover, if a Bain recorder be placed in the circuit a continuous line will be found traced out on the paper slip, and not

a mere dot simply. Substitute a permanent magnet for the iron core, and a diaphragm for the movable permanent magnet, and we have the condition of affairs in a Bell receiver.

With regard to the second paragraph in Mr. Strangways' letter, the answer is this: In a break such as takes place in a Reiss transmitter there is a change in the current from, say, 10 milliampères (when the circuit is closed) to 0 milliampères (when the circuit is open). There is no period at which a current of, say 5 milliampères flows; in the undulatory current the strength commences at 10 empères, and falls down gradually to 0 milliampères, there being periods at which every strength of current intermediate in value between 10 and 0 ampères exists. Suppose we have the diaphragm of a Reiss transmitter transmitting a note which is produced by 100 vibrations a second, then when the two platinum surfaces are in contact we have a current of, say, 10 milliampères flowing. This current lasts for $\frac{1}{100}$th of a second; a break now takes place, and the current becomes zero. The period during which this cessation lasts is also $\frac{1}{100}$th of a second. Contact is now again made and the current of 10 milliampères again flows, and so on.

In the case of the microphone the action is as follows: At first a current of 10 milliampères flows, the pressure of contact now varies so that at, say $\frac{1}{4}$th of the $\frac{1}{100}$th of a second the current has fallen to 9 milliampères, at $\frac{2}{3}$ths of the $\frac{1}{100}$th of a second it has fallen to 8 milliampères, at $\frac{1}{2}$ths of $\frac{1}{100}$th, that is, at the end of $\frac{1}{100}$th of a second, the current is 5 milliampères; the pressure of contact now varies the other way, so that the current runs up by uniform stages (not steps) up to 10 milliampères again, and so on. In the example I have taken I have supposed the increase or decrease of current to have taken place uniformly, *i. e.*, if the times and corresponding currents were plotted out graphically, the points when joined would form a straight line; but the currents corresponding to any particular period might be such that the results plotted out form a curve, and not a straight line; it is the form of this curve that determines the timbre or quality of a tone; this it is obvious must be entirely absent in a simple make-and-break arrangement. Again, in the case of the make and break, the changes that take place in the current are changes from 10 milliampères to 0 milliampères, or a difference of $10 - 0 = 10$; in the case of the microphone we have supposed the variation to take place from 10 to 5, or a difference of $10 - 5 = 5$, in other words the loudness of the sound in the latter case would be only half as great as it is in the case of the make and break, but it might happen that the change is from 10 to 8 ampères only, in which case the sound would be less loud still. Here, then, we have variation of loudness, which is the third characteristic of sounds; this characteristic in the make-and-break arrangement is fixed and invariable.

My argument, to which Mr. Strangways refers at the end of his letter, was perhaps not a perfect one, nor was it meant to be an exact parallel to the exact state of the case; but I simply wished to point out that Mr. Strangways argued that because the make-and-break arrangement was able to produce one of the three characteristics of articulate speech, viz., "pitch," that therefore it could produce them all. Referring again to Mr. Strangways' first letter, in which he brings forward as an argument for the make-and-break theory the fact that Reiss' transmitter will produce articulate speech, as your leader of the 4th ult. clearly points out, this articulate speech is only produced when the make-and-break action does not take place.

Yours faithfully,

TELEPHONE.

London.

The Action of the Telephone.

To the Editor of The Electrical Review.

SIR :—Though the discussion in one's own name with an anonymous correspondent is seldom satisfactory, the tone of "Telephone's" letter indicates that it is not necessary to apply that rule to him; I therefore ask him to be good enough to tell me how to "send through the primary coil a current whose strength continually and uniformly diminishes or increases." I mean how to send through the primary coil a current which is clearly, unmistakably, and indisputably that which Bell describes as an undulatory current, and which is not a mere series of impulses. I have carefully watched the effect of the current of a Bell telephone, used as a generator, in a very sensitive reflecting galvanometer and, in my judgment, the effect in the galvanometer is produced by a series of impulses, and that there is not a continuous current.

In the second paragraph of his letter, "Telephone" admits the existence in the alleged undulatory current of "a point where there is no potential, *i.e.*, where no current flows." Let me ask in what respect is this different from a break? I fail to realize the analogy in the last paragraph of "Telephone's" letter, and should be glad to learn how a current of electricity can pursue "a sinuous course" along a wire .005 of an inch, or less in diameter.

I am, Sir, your obedient servant,

London. H. B. T. STRANGWAYS.

Miscellaneous Notes and Facts.

The Swallow at Craigenputtoch.

BY MRS. CARLYLE.

[Carlyle's wife, delicately reared, accomplished and much admired, was condemned to pass seven years, childless and in bitter poverty, with him, morose, uncompanionable, exacting, at Craigenputtoch, the dreariest, loneliest spot in Scotland. There she wrote and sent to Lord Jeffery these lines]

To a Swallow building under our Eaves.

Thou too hast traveled, little fluttering thing—
Hast seen the world, and now thy weary wing—
Thou, too, must rest,
But much, my little bird, couldst thou but tell,
I'd give to know why here thou lik'st so well
To build thy nest.

For thou hast passed fair places in thy flight;
A world lay all beneath thee where to light;
And, strange thy taste,
Of all the varied scenes that met thine eye—
Of all the spots for building 'neath the sky—
To choose this waste.

Did fortune try thee? was thy little purse
Perchance run low, and thou, afraid of worse,
Felt here secure?
Ah, no! thou need'st not gold, thou happy one!
Thou know'st it not. Of all God's creatures, man
Alone is poor!

What was it then? some mystic turn of thought,
Caught under German eaves, and hither brought,
Marring thine eye
For the world's loveliness, till thou art grown
A sober thing that dost but mope and moan
Not knowing why?

Nay, if thy mind be sound, I need not ask,
Since here I see thee working at thy task
With wing and beak.
A well-laid scheme doth that small head contain,
At which thou work'st, brave bird, with might and main,
Nor more need'st seek.

In truth, I rather take it thou hast got
By instinct wise much sense about thy lot,
And hast small care
Whether an Eden or a desert be
Thy home so thou remains't alive, and free
To skim the air.

God speed thee, pretty bird; may thy small nest
With little ones all in good time be blest.
I love thee much;
For well thou managest that life of thine,
While I! Oh, ask not what I do with mine!
Would I were such!

The question of an electric railway for Berlin is being considered. The railway would run from the west to the east of the city, and would establish direct communication with the metropolitan railway. It is to be constructed overhead, and supported on high columns. The trains are to lower themselves on arriving at each station to the level of the street for passengers to get out and enter, and will then again be elevated to the level of the line overhead, all this being accomplished by power supplied by means of electricity.

Some interesting notes have been published concerning the hydraulic works for the use of the Industrial Exposition at Milan, and of the new fountain erected in that city. The total cost of the works was $16,000. The daily supply of the fountain costs $1.80, and the water is thrown to a height of some 87 feet, involving an expenditure of about 9 gallons of water per second. The effect is quite as striking as that of either of the other great fountains of Europe. The Berna fountain consumes about 18 gallons per second; the Trafalgar Square, 16; the Stoccarda, 15½; the Turin, 12½; each of the fountains of the Place de la Concorde, 15½; each of the Rond Point, 9; that of the Place Belle Court 10, and that in the Place du Chateau, Brussels, 10.

Florida seems to offer a fine field for the poet of the future—tropical scenes, sunsets, Indian names, traditions, oranges, alligators, heroes, heroines, heavy fathers, mosquitoes. What could a poet desire more? —*Andrews' Queen.*

Perhaps a little money to get there might come in handy.

General Sanford has growing on his place in Orange County, Fla., the Camphor and cinnamon tree, bergamot oranges and lemons, India crab grass, the Australian olive wood, golden apples, and the Brazilian palm.

None but the brave, sings Dryden, deserve the fair; and yet we have observed that where it is a question between a veteran who has waded through gore and a pretty militiaman, rich girls invariably prefer the militiaman.

A Chicago jury has awarded $3,500 to a tenant whose family was made ill by sewer gas, the landlord having represented that the plumbing was perfect.

Two hundred men laid 300 feet of railroad track in thirteen minutes, at Burlington, Iowa. They worked at this rapid rate to avoid an injunction.

Hail, as aforesaid, gentle spring.

Between the acts of "The Mascot," in Richmond, by McCaull's Opera Company, the stage manager said to the audience: "Ladies and gentlemen, I must claim your indulgence for Mr. Standish, who plays *Pippo* to-night. The gentleman who was billed for the part has unfortunately fallen a victim to Virginia hospitality."

A German comic paper, which ventured some fun about Prince Bismarck, has just had its circulation stopped for two years, at the end of which time it will presumably either be dead or else furnish an extraordinary example of suspended animation; and meanwhile that luckless editor, who was put in jail three months for libeling the same august functionary, has been sentenced to an extra week for taking in vain the name of Mr. Gambetta. The distinction between three months for Bismarck and a week for Gambetta, is instructive. But journalism in Germany is prosecuted under difficulties.

It is extraordinary what an amount of cedar and other pen and pencil woods are chawed up in writing spring poetry. One man tells us he has eat up nearly an entire tree since he began inspiring for the magazines.—*Andrews' Queen.*

The Chicago *Inter-Ocean* intimates that this is one of the years when plumbers' families will not visit summer watering places. The Chicago *Inter-Ocean* may speak for Chicago. In this section plumbers generally are sending their families to Europe.

The total production of zinc in Europe in 1880 was 203,330 tons. Germany produced 99,405; Belgium, 65,010, England, 22,000; France 13,715; and Austro-Hungary, 3,200.

It is almost amusing to see how Hartford people, as well as people in other parts of the state, are getting on with telephone companies, while Winsted tips back in her easy-chair and smiles the smile of satisfaction. In most places, Hartford included, the telephone company uses a bell which rings up Tom, Dick and Harry, when only the latter is wanted. Winsted has had a telephone about as long as any place in the state, but our local managers have some regard for the tympanums of their patrons and give them all individual call-bells. There are nearly a dozen patrons on the wire which comes to us but when our bell rings we know it means us and nobody else. Hartford and other provincial towns might be as well accommodated as Winsted if they would get mad and refuse to listen longer to the jingling of the bells. Say to your telephone managers that you want as good a bell as Winsted has. It might cost the managers a little extra, but they would make enough even then.—*Winsted Herald.*

Grain Freight Free to Liverpool.

The speculative holding of grain at Chicago for higher prices led, in the fore part of April, to some curious results. The export of grain had been stopped, the market rates at Liverpool being lower than those of Chicago. The railway officials refused to lower their rates, saying that they saw no good reason for sacrificing their revenues to enable the promoters of "corners" to adjust questions of supply and demand between themselves and consumers. The managers of certain ocean steamship lines having steamers billed for early departure, were in great straits for freight, and even begged for grain to be carried as ballast, freight free. A press dispatch from Chicago, April 7, said that the day before the agents of the Eastern lines terminal there were asked by wire if they could not furnish small cargoes on condition that no charge should be made for transporting it by water to Liverpool. Again, on the 7th, the steamship people renewed their appeal, offering as additional inducement a premium of several cents per hundred pounds to the shipper. The offer of a premium was made by the four lines running between Boston and Liverpool. No offers of so unusual a nature were received from the New York lines.

As a warning to those who carry this sport too far, let us call attention to the pangs that afflict the poetic soul which has ground out with infinite dole stanzas doomed only to heap up the waste basket, or light the editorial cigar. Read, oh aspiring neophyte, and heed the wail of one whose sad refrain is evermore—

"Refused."

"With thanks returned." Ah, is it so?
The lines I thought would gain
A place obscure at least; but, no,
Unread they now remain.
Why strive to conjure up an art
Which has its source deep in the heart?

And yet I hoped, I know not why,
The thought presumptuous seemed,
To picture scenes of fame, and wake
To find I've only dreamed.
But will I, in the Judgment Day,
Refused by God, be turned away?

J. Robert Rainey.

We are glad to assure this disconsolate poet and all others in like afflicting circumstances, that we know of no doctrine, human or divine, that excludes any from the joys of Heaven because he cannot write poetry. We hope, moreover, that such doctrine may never be promulgated during the term of our natural life. In this case, our friend has proved that when the rule of conventionalism is abandoned, and a crisp salad-leaf offered instead, refusal is instantly changed to an acceptance.

So in the spring-time brightness turn we from the winter's shadow to the summer sunshine—from the salad leaf to the flower and fruit.

Albion W. Tourgee.

The Kingship of Cotton.

Whoever controls the cotton goods of the world controls the exchanges of the world. In this sense, "cotton is king." The great mistake of the Southern people, in thinking that cotton was king, consisted in believing that raw cotton was king. There was a little of truth in their belief, as there is in most widespread popular delusions. Whoever controls the cotton cloth is a king, and powerful though not an unlimited monarch. Very few people want raw cotton; or can do anything with it, individually; every one wants cotton cloth, in some form, and every one can individually turn it to his purpose. The Southern people did not see this truth, and therefore never perceived that they were more completely dependent on the *manufacturer* of cotton than almost are the raisers of any other agricultural product whatever upon the consumer of that particular article. Of all the great products of agriculture, cotton in its raw state is one of the least necessity to the individual man. It requires the capital, skill, and mechanic arts to make it available.—*Senator Bayard.*

The Pilsen Arc Lamp.

One of these lamps is now being exhibited at Charing Cross, outside the show room of the Faure Accumulator Company. The number of secondary calls employed for the purpose is twenty-five, and the current strength developed about eight amperes. The steadiness of this lamp under almost any circumstances (the ludicrous exhibition of it at the Society of Telegraph Engineers notwithstanding) is one of its leading features, and when worked from this secondary battery it is difficult to imagine any arc lamp more perfect.

There is a spasmodic newspaper published in Maine which has got to be tri-weekly. It comes out one week and tries to comes out the next.

A Story of Early Steam Traveling.

It is related that an old country dame committed herself for the first time to a railway carriage, and, by a misadventure, the train on arrival that very day was run too quickly into the station, so that a van or two became smashed, and the passengers were much thrown about. The old lady in particular was jerked under the seat upon the top of her bandboxes, where she was found by the guard, meekly and patiently awaiting the opening of the door. Upon his exclaiming, "For goodness sake, ma'am, come out; there's been an accident!" she gently replied: "Oh, sir, I thought you always stopped like this."

A new office has been opened in the Pennsylvania Railroad station in Philadelphia. On it is the sign, "Bureau of Information," and at the open window stands a bland man, ready to answer all manner of questions about travel on the Pennsylvania and connecting lines. Whenever he gets stuck by a hard query he uses the telephone or telegraph to get the right reply. This is intended to relieve the other employees and accommodate the passengers.

Spring poetry is not without its humors, however. "How do you buy your poetry—according to quantity or quality?" inquired the author of some "Verses to Spring," which would have been worth a fortune if "quantity" were the test. After grave consideration the editor replied on behalf of himself and his associates:

"As we are just beginning, we buy our poetry at present by the cubic yard. When we get fully under way we expect to buy it by the cord. It will have to be cut into proper lengths to suit, or warranted to split without eating in the grain. Price according to quantity—the less there is of it the more we pay."

The Telegraghers' Concert is announced for Wednesday evening, May 3, 1882, at Chickering Hall. Tickets are already becoming scarce, and everything points to a financial and artistic success. The following artists have been secured: Miss D. E. Barnicle, soprano; Miss H. L. Story, contralto; Miss D. W. McAneeney, tenor; Henry S. Brown, basso; the quartette from the Telegraphers' Glee Club; Miss Maud Morgan, harpist; George W. Morgan, organist; Albert Greenhalgh, accompanist.

The Waterbury Watch is a substantial and accurate time piece, of a newly improved design, stem winder, open face, in silveroid cases, and sells for about three dollars and a half. Each watch is thoroughly tested and regulated before leaving the factory, and is all ready for use when sold by the retailer. So well known have they become as reliable time keepers, thousands buy them in preference to higher priced watches.

We notice Messrs. E. & F. N. Spon, of 446 Broome street, have opened a new store at 44 Murray street, where they will be found on and after May 1st.

We are happy to acknowledge the following terse compliment from the *National Beacon*, an enterprising and bright daily at Chillicothe, Mo, published by those generous gentlemen Messrs. Foster & Jacobs—may every success attend them:

The Telegraph and Telephone, a new scientific paper, is just what every scientific mind should peruse. It is published in New York city at $2 per annum, and is just what its name implies.

NEW PATENTS—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING APRIL 4TH, 1882.

256,081. Dynamo-electric Machine. Friedrich Von Hefner Alteneck, Berlin, Germany. Filed Jan. 14, 1882. (No model.) Patented in England June 5, 1873.

255,795. Electric light regulator. Nathaniel S. Keith, New York, N. Y., assignor to the Fuller Electrical Company, same place. Filed Feb. 26, 1880.

255,794. Electric lamp. Nathaniel S. Keith, New York, N. Y. Filed March 2, 1881. (No model.)

256,091. Electric lamp. James J. Wood, Brooklyn, N. Y. Filed January 14, 1881. (No model.)

255,931. Electric generator and motor. Jesse H. Bunnell, Brooklyn, N. Y. Filed Aug. 3, 1881. (No model.)

255,999. Electric lamp. Charles D. Jenny, South Bend, assignor to the Fort Wayne Electric Light Company, Fort Wane, Ind. Filed Aug. 30, 1881. (No model.)

255,800. Insulator for electrical conductors. Albert C. Lewis, Brooklyn, N. Y. Filed July 2, 1881. (No model.)

255,932. Mechanical telegraph sounder. Jesse H, Bunnell, New York, N. Y. Filed Jan. 4, 1882. (No model.)

256,070. Secondary voltaic cells. Joseph Wilson Swan, Newcastle-upon-Tyne, County of Northumberland, England. Filed Jan. 18, 1882. (No Specimen.) Patented in England, Dec. 15, 1881.

255,814. Signaling on electric circuits. David Hall Rice and Lepine C. Rice, Lowell, Mass., assignors to the Currier Telephone Bell Company, of Massachusetts. Filed Nov. 14, 1881. (No model.)

255,824. System of electrical distribution. Elihu Thompson, New Britain, Conn., assignor to the American Electric Company, same place. Filed June 8, 1881. (No model.)

255,754. Telephone. Edward H. Amet, La Grange, and William S. D. Hunt, Irving Park, Ill. Filed July 19, 1881. (No model.)

255,766. Telephone exchange apparatus. Charles E. Buell, New Haven, Conn., assignor of two-thirds to James D. Smith, Hackensack, N. J., and George W. Coy, Milford, Conn. Filed Dec. 12, 1881. (No model.)

255,885. Thermo-electric battery. Andrew Patterson, Idlewood, Pa. Filed Jan. 9, 1882. (No model.)

ISSUE OF APRIL 4, 1882.

Patents...358—No. 255,752 to No. 256,109, inclusive
Designs... 13—No. 12,842 to No. 12,854, inclusive
Trade-M'ks 19—No. 9,253 to No. 9,271, inclusive
Labels.... 4—No. 2,657 to No. 2,660, inclusive
Reissues of patents, 11—No. 10,068 to No. 10,078 inclusive.

Total issue, 405.

FOR WEEK ENDING APRIL 11TH, 1882.

256,253. Chemical telegraph. Wilhelm C. Taucke, New York, N. Y. Filed Aug. 20, 1881. (No model.)

256,182. Dynamo-electric machine. Wm. Wheeler, Concord Mass. Filed May 23, 1881. (No model.)

256,212. Draw-plate for preparing fibrous filaments for electrical carbons. John H. Guest, Brooklyn, N. Y. Filed Sept. 24, 1881. (No model.)

256,391. Dynamo-electric machine. Henry B. Sheridan, Cleveland, Ohio. Filed July 19, 1881. (No model.)

256,392. Dynamo-electric machine. Henry B. Sheridan, Cleveland, Ohio. Filed Aug. 22, 1881. (No model.)

256,450. Device for charging and discharging secondary batteries. Charles E. Buell, Newhaven, Conn. Filed March 4, 1882. (No model.)

256,262. Electrical relay. Clement Ader, Paris, France. Filed Sept. 24, 1881. (No model.) Patented in France, May 30, 1881; in England, July 7, 1881; in Belgium, July 8, 1881; in Italy, Aug. 1, 1881; in Spain, Oct. 7, 1881; and in Austria-Hungary, Oct. 29, 1881.

356,386. Electric clock. Jacob Schweizer Soleure, Switzerland, assignor to Cornelius Roosevelt, New York, N. Y. Filed Sept. 2, 1881. (No model.)

256,213. Forming and treating electrical carbons. John H. Guest, Brooklyn, N. Y. Filed Sept 7, 1881. (No model.)

256,189. Magneto-electric generator for signaling purposes. James G. Arnold, Worcester, Mass. Filed July 11, 1881. (Model.)

256,427. Relay and sounder. Charles G. Burke, New York, N. Y. Filed Jan. 18, 1882. (No model.)

256,258. Telephone-exchange system. Thomas A. Watson, Everett, assignor to the American Bell Telephone Company, Boston, Mass. Filed April 20, 1880. (No model.)

256,432. Telephone-exchange system. Edwin T. Greenfield, Brooklyn, N. Y., assignor of one-half to the Holmes Burglar Alarm Telegraph Company, of New York. Filed April 23, 1881. (No model.)

256,397. Underground-telegraph line. Warren D. B. B. Smith, Boston, Mass. Filed Dec. 5, 1881. (No model.)

ISSUE OF APRIL 11, 1882.

Patents, 341—No. 256,110 to No. 256,450, inclusive.
Designs, 32—No. 12,855 to No. 12,886, inclusive.
Trade Marks, 22—No. 9,272 to No. 9,293, inclusive.
Labels, 4—No. 2,661 to No. 2,664, inclusive.
Reissues of patents, 9—No. 10,079 to No. 10,087, inclusive.

Total issue, 408.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisement appear in this journal. In ordering please state the number and date of the patent desired.

New Patents—Great Britain—March and April, 1882.

1385. An improved construction of electric contact-making thermometer. J. Formby. Dated March 22.

1390. Apparatus for driving, regulating, and indicating speed of dynamo machines used for lighting purposes, specially applicable for railway vehicles on or to which dynamos can be affixed for producing the current by the motion thereof. J. B. Rogers. Dated March 22.

1392. Improvements in incandescent electric lamps and in the preparation of carbons for the same. D. Graham and H. J. Smith. Dated March 22.

1400. Incandescent electric lamps. T. E. Gatehouse. Dated March 23.

1405. Improvements in electric gas-igniting apparatus, parts of which improvements are applicable to batteries for the generation of electric currents generally. J. W. Urquhart. Dated March 23.

1412. Electric lighting and apparatus connected therewith. O. E. Woodhouse and F. L. Rawson. Dated March 22.

1437. A new or improved electric accumulator for the storage of electric energy. S. Cohne. Dated March 25.

1444. Electric incandescent lighting apparatus. R. Werderman. Dated March 25.

1455. Secondary batteries for the storage of electricity. G. Molloy. Dated March 27.

1462. Electric Lamps. S. Waters. Dated March 27.

1464. Electric piles or batteries. F. de Lalande. (Partly communicated by G. Chaperon.) Dated March 27.

1465. Carbons for electric lamps. A. Smith. Dated March 27.

1483. An improved coiling machine. C. L. Clarke and J. Leigh. Dated March 28.

1496. Dynamo or magneto-electric machines for regulating the generative capacity of such machines. T. J. Handford. (Communicated by T. A. Edison.) Dated March 28.

1516. An improved manufacture of material for electrical insulation. J. Imray. (Communicated by La Société Anonyme des Cables Electriques.) Dated March 29.

1526. An improved method of, and apparatus for, transmitting and printing telegraphic messages. W. R. Lake. (Communicated by A. F. and F. B. Johnson.) Dated March 29.

1548. Secondary batteries. W. B. Brain. Dated March 30.

1555. Telephones. J. H. Johnson. (Communicated by C. G. Rodrigues-Pereire.) Dated March 30.

1556. Generation, storage, distribution, regulation and utilization of electricity, and apparatus or means therefor. J. S. Williams. Dated March 30.

1570. Electric arc lamps. W. Jeffrey. Dated March 31.

1574. An improved method of, and apparatus for, augmenting or strengthening electric currents for telephonic purposes. W. R. Lake. (Communicated by J. Moser.) Dated March 31.

1580. Electric lamps. Sir D. Salomons. Dated March 31.

1583. An improved electric bell and electric battery. H. Binks. (Communicated by M. J. Siegel.) Dated April 1.

1587. Secondary batteries. A. Tribe. Dated April 1.

1600. Electrical apparatus for employment in the indicating and extinguishing of fires. G. W. Von Nawrocki. (Communicated by F. Bahr.) Dated April 1.

1611. Improvements in electro-magnetic and regulating apparatus, chiefly designed for use in electric lamps. W. R. Lake. (Communicated by E. Weston.) Dated April 3.

1614. Magneto or dynamo-electric machines. W. R. Lake. (Communicated by E. Weston.) Dated April 3.

1616. Mode of, and machinery for, the production of electric currents. W. B. Brain. Dated April 3.

1618. Improved arrangement of incandescent or other electric lamp, to render it portable and capable of being fitted temporarily at any available place or position, and removable therefrom at will. J. B. Rogers. Dated April 3.

1619. Improvements in the manufacture of carbon conductors or electrodes for electric lamps, and in apparatus therefor. W. R. Lake. (Communicated by H. S. Maxim.) Dated April 3.

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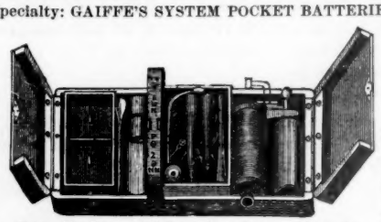

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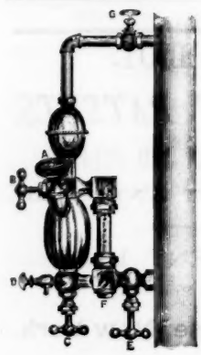

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